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ABSTRACT

To disseminate inquiry training methods and materials, the project produced instructional films on the methods, prepared a teacher's manual, and conducted an institute to train teachers and administrators in the procedures. Twenty educators from 11 school districts were enrolled in the summer institute as team members and were trained for 4 weeks through seminars, class demonstrations, group discussions, and individual conferences. Teams then returned to their districts where they conducted inquiry training classes with at least one group of gifted elementary or junior high students. Provisions were made for visitors to attend classes, for special demonstrations, and for additional dissemination. Conclusions were that the teams stimulated interest within various school districts and gained experience in conducting inquiry sessions; they also aroused public approval as parents and others requested the continuation of the programs. Most of the districts have continued the training and many have reshaped their programs. Teacher characteristics which were found to be influential were flexibility, objectivity, willingness to turn over the process to the children, sympathy for the process, awareness of children's cognitive needs, and competence in the subject. (RJ)

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University of Illinois

DEMONSTRATION CENTER:
PART II - ELEMENTARY SCHOOL PROGRAMS IN SCIENTIFIC INQUIRY FOR GIFTED STUDENTS

J. Richard Suchman
Principal Investigator

Report Prepared by
Sybil B. Carlson

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Report Prepared by
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March 1968

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Sybil B. Carlson
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March 9, 1968

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CHAPTER I

INTRODUCTION

Inquiry is the search for new knowledge. The inquirer brings new knowledge into existence by gathering data, processing it, inventing theories to explain the data and testing the power of the theories to predict, control, or explain other data. Our traditional focus in education has been on promoting the acquisition and storage of facts, conclusions, and generalizations and the use of these in making decisions and solving problems. But we have neglected the development of those cognitive skills that enable a person to become a more autonomous and productive inquirer. We have failed to cultivate a natural resource latent in the mental apparatus of every individual...the ability to go beyond the data and generate new theories of causation. If theories have emerged from our educational system it has probably been despite the system rather than because of it.

For gifted children, particularly those who are especially creative and capable of thinking at highly abstract levels, the mode of theory building is one in which the child's intellectual powers can be given full play. Ultimately many of these individuals will make their most valuable contributions to society through the ideas and theories they generate. But the mode of mental activity that leads to creative thinking can be cut off and held back by a school environment that reinforces conformity in learning; one that emphasizes the storage of verbalized concepts and generalizations and promotes the rhetoric of conclusions.

The storage of facts, principles, and conceptual models has unquestioned value in providing resource material that can later be used in attacking problems and exploring the "unknown." Without the ability to use these resources effectively to gather and analyze new data, to scan, to test and modify conceptual models in search of workable theories, no amount of stored knowledge will have functional value even in the most highly gifted child. Children think more productively than they memorize. They pursue theory construction with more interest and motivation than they have when they memorize or apply existing theories.

We can best capitalize on this productivity and motivation by recasting the learning process into one that allows a high degree of inventiveness, one that frequently starts with what is observable and certain (data) and moves toward what is inferred and never certain (theory).

New movements in curriculum development represent a major shift toward a more inductive teaching approach. They have broken away from the traditional rhetoric of conclusions, engaging the student in the observation and measurement of phenomena and the construction and validation of theory. Almost all of these current efforts, however, have been at the secondary school level and all of them wholly within traditionally defined content areas.

At the elementary school level we are still pretty much committed to teaching facts, generalizations, and specific performance skills. Causation, regardless of the content area, is generally dealt with categorically so that the child accepts the causal structures presented by books and teachers as having some kind of permanent and unquestionable validity.

Inquiry training was developed as a way of introducing the child to strategies of autonomous search, data collection and processing, inferential thinking, and theory construction and validation. It is aimed at freeing him from total dependence on others to program and implement his conceptual growth.

The inquiry training method itself has three basic elements: (1) a concrete problem which usually consists of a filmed episode which is presented to the pupils to be analyzed and explained, (2) a means of gathering data (usually by asking questions) which permits the pupils to verify the parameters of the episode and experimentally manipulate variables to determine the effects, and (3) freedom to attack the problem in any way the pupils wish. Through practice and feedback the children come to recognize the functions of analysis and experimentation and the kinds of operations that are most effective in performing these functions. They become aware of strategies which they begin to employ and perfect in subsequent inquiry sessions. Ultimately they gain a clearer picture of the goals of inquiry and its role in constructing and testing useful theories of causation.

Through a series of pilot projects and field studies the inquiry training methods and materials have received a thorough tryout and evaluation over the past five years. The first major project to be completed, The Elementary School Training Program in Scientific Inquiry (Suchman, 1962) involved the preparation of 12 teachers and administrators who subsequently conducted inquiry training in their districts for 24 weeks. A total of nearly 400 children received inquiry training while approximately an equal number were involved in the control groups. Evaluation procedures included measures of conceptual growth and the analysis of inquiry strategies. The principle findings of this project were that inquiry training (1) more than doubles the fluency of inquiry, (2) increases the use of analytical procedures, and (3) reduces the use of diffuse and unstructured approaches. The latter two effects were most pronounced among the more highly verbal children.

Further analysis showed that children who had higher I.Q's, more analytical cognitive styles, and greater conceptual sophistication in the content area (physics) showed greater gains from inquiry training than the less bright, less verbal and less analytical children. It was clear that gifted children were better able to utilize the autonomy provided under the inquiry method. They were in a better position to bring into play their diverse intellectual resources. There was one big problem with gifted children that was most pronounced in the early training sessions. Because of their high verbal abilities and well-differentiated conceptual schemes, they had fallen into the habit of attacking problems intuitively without bothering to analyze the data before drawing inferences. Although this strategy had paid off in the past because these children had not frequently been challenged by complex problems of causation, the inquiry problem films could not be easily explained without analysis. The children were forced to utilize a more analytical mode which some of them resisted for a time. However, once they made this shift, their productivity in the inquiry situation far exceeded that of their less gifted and less verbal contemporaries.

Several small-scale attempts at dissemination have been made in the past. Most of this work was centered in California where the State Department of Education has seen fit to promote the dissemination of inquiry training. A series of workshops was held with administrators and curriculum specialists in an attempt to give these leadership personnel a level of competence that would enable them to work with teachers on a continual basis. One group in southern California representing districts over a four-county area has been meeting on a monthly basis for a year to enable the members to exchange their ideas and pool their experiences as they attempt to introduce inquiry training into the elementary grades. These experiences have brought to light some of the necessary conditions for successful dissemination.

Most of the teachers worked with have shown interest in finding out about new approaches, particularly when these bear on the development of cognitive skills and the intensification of pupil motivation. Communicating the new approach to a group of teachers seems to be best achieved through demonstrations, particularly when these are accompanied and followed by interpretive comments that show why each step or strategy in the teaching stems from some consistent theoretical structure. If the theory is understandable and acceptable to the teacher and the results of the methods are desirable and clearly observable, the teacher is usually willing to undertake some kind of in-service training in order to become proficient at it.

This phase of dissemination requires the presence of a person who can work with the teacher on a regular basis, observing his attempts to master the new approach and helping him interpret the effects of his efforts. It is also helpful for the teacher to have printed materials to serve as a guide and help him more fully to comprehend the theory behind what he is doing. Without learning _why_ the new approach has the desired effects, the teacher cannot adapt it to fit his own style of teaching. If the approach is learned only as a "method," an externalized set of rules, it may never become a part of the teacher's total mode of operation and may therefore have no lasting effect. It has been the experience of those familiar with inquiry training that the complete assimilation of a new teaching approach such as inquiry training requires, in addition to a full understanding of the rationale, a considerable amount of freedom and time to experiment.

An Inquiry Training Demonstration Center

The purpose of this project was the dissemination of the inquiry training methods and materials developed by the Illinois Studies in Inquiry Training. Inquiry training represents a radical departure from traditional expository teaching. First, its prime objective is to develop a process rather than convey new subject matter content. Secondly, the roles of the teacher and the children are drastically restructured. These two facts pose a major difficulty in dissemination, because effecting such large changes is not easy in schools where traditional methods are widely practiced and are uncritically accepted.

This demonstration project was operated on the following assumptions about curriculum change:

That teachers are more likely to accept and adopt a major curriculum change if:

a. They can see the new approach in operation over time.

b. They can see for themselves the outcomes of the new approach.

c. They are helped to discover the fundamental philosophy and theory underlying the new approach.

d. They have ample and continuous supervised practice in the use of the new approach under the guidance of a person who can interpret it in terms of a theory that is meaningful and acceptable to the teacher.

e. The teacher is given the freedom to modify and adapt the new approach to suit his own style of teaching and to make it an integral part of his total teaching program.

In keeping with these assumptions, the demonstration project had three major operational foci:

(1) Demonstration: The production of films presenting a wide range of inquiry training episodes. The purpose was to capture a comprehensive and realistic picture of the inquiry training process in action.

(2) Interpretation: The preparation of a teacher's manual giving treatment to the theory as well as to the more practical matters of inquiry training techniques and evaluation procedures.

(3) Guided Practice: Institutes conducted to train, assist, and guide teachers and administrators who wish to learn and practice inquiry training in their classrooms. To ground them in the appropriate theories of learning, cognition, and motivation, and training to interpret the inquiry process in terms of such theory, to be equipped to demonstrate inquiry training techniques and to analyze the inquiry skills of any child.

By preparing a group of inquiry training specialists and providing them with special materials to facilitate demonstration and interpretation on a continuous basis, the objective was to reach a significant number of teachers with a program of curriculum change that will have an immediate impact and a permanent effect on curriculum organization and teaching methodology.

The immediate effect of such a program would be to introduce inquiry training into a number of school districts. The ultimate outcome might be the reorganization of curriculum with the inquiry process playing a more central role and replacing much of the now dominant teacher-programmed learning.

CHAPTER II

DESIGN AND PROCEDURE FOR DISSEMINATION

Under the direction of the demonstration center at the University of Illinois, eleven demonstration centers were established in the Midwest in September, 1964. These centers serve to introduce the theory, methods and materials of inquiry training to educators and the general public. The principal focus has been the promotion of the use of inquiry training with gifted children, to enhance their capacity for independent, productive exploration. Each demonstration center is situated in a school district, and a team from each district was specially trained at a four-week summer institute prior to the second year.

During the early spring of 1964, summer institute announcements were prepared and distributed to curriculum leaders throughout a seven-state area in the Midwest. District administrators appointed individuals to serve as leadership teams by submitting applications for them. These applications for the summer institute were received and screened, and 20 educators were accepted for enrollment as demonstration team members. A team usually consists of one administrative leader (e.g., supervisor, curriculum specialist, principal) and one classroom teacher at the intermediate or junior high level. In two cases, a one-man team was selected on the basis of district support and ability to operate as a demonstration center. Each team accepted the responsibility of establishing and maintaining the demonstration center in their school district. They agreed to carry out the terms of the project, and to pay for expenses other than tuition either with personal or district funds. A list of the demonstration teams and the school districts they represent follow:

Community Consolidated School District No. 59
Arlington Heights, Illinois
    Brentwood School, DesPlaines, Illinois
        Mr. Ethan Janove, principal
        Miss Ruth Lang, teacher

Decatur Public School District No. 61
Decatur, Illinois
    Centennial Junior High School
        Mr. William K. Williams, assistant principal
        Mr. Mason L. Rhue, teacher

Community Consolidated School District No. 65
Evanston, Illinois
    Nichols Junior High School
        Mr. Thomas A. Sinks, principal
        Mr. Jeremiah Floyd, teacher

Lincolnwood Schools
Lincolnwood, Illinois
    Lincoln Hall Junior High School
        Mr. Richard F. Powers, principal
        Mr. Jack E. Lowry, Jr., teacher

Community Consolidated School District No. 15
Palatine, Illinois
    Carl Sandburg Junior High School, Rolling Meadows, Illinois
        Mr. Jordan G. Vogel, teacher
    Stuart Paddock School, Palatine, Illinois
        Mr. Donald H. Riek

Park Forest School District No. 163
Park Forest, Illinois
    Mohawk Elementary School
        Mr. George W. Pruitt, principal
        Mrs. Franziska B. Naughton, teacher

Lansing Public Schools
Lansing, Michigan
    C. W. Otto Junior High School
        Mr. John Anderson, teacher

Livonia Public Schools
Livonia, Michigan
    Kennedy Elementary School
        Mr. Clyde L. Jack, principal
        Mr. Miron Stolaruk, teacher

River Rouge Public Schools
River Rouge, Michigan
    River Rouge High School
        Mr. Fredric A. Rivkin, teacher

University City Public Schools
University City, Missouri
    University Forest School
        Mrs. Elizabeth W. Hauseman, resource teacher
        Miss Olga L. McDaniel, teacher

The City School District of Canton, Ohio
Canton, Ohio
    Loren E. Souers Junior High School
        Mr. Richard R. Dowding, principal
        Mr. David Bertsch, teacher

The Demonstration Teams

During the first year of operation of the demonstration centers, each leadership team was expected to attain the two following goals:

1. Each team was to gain experience in conducting inquiry training in their classrooms. They were required to select gifted students at the intermediate or junior high levels, using their own or district criteria for selection, to participate in the inquiry training program.
2. The teams were to serve also as centers for demonstration, in that they would acquaint parents and educators with inquiry training concepts and procedures. Their activities were to be directed toward the arousal of greater interest on the part of educators and parents in bringing inquiry into the educational process, particularly for the gifted child.

These objectives were to be met by means of the following:

1. Inquiry training classes conducted on a regular basis with at least one group of gifted elementary or junior high students.
2. Provisions for visitors in the classroom.
3. Special demonstrations for the public and educators.
4. Additional dissemination through conferences, televised demonstrations, coverage in local newspapers and district bulletins, and parent-teacher meetings.

Within the second year (1965-66 term) following their special institute training, the leadership teams are prepared to function autonomously in the training of more educators who wish to undertake inquiry training in their classrooms. With the guidance and support of the teams, this program can be made available to more children in each district. Thus, inquiry training can play a significant role in the enrichment of the curriculum for the gifted within the space of a few years.

Development of Demonstration Materials

A teacher's manual and two demonstration films were prepared specifically for this project. Other materials to serve as aids in achieving the objectives of the demonstration centers were either developed for the 1962 inquiry training study, or for Science Concept Development in the Elementary School Through Inquiry Training, Cooperative Research Project Number 1547 (Suchman & Carlson, in preparation). Full details and descriptions of the materials not designed for this project alone are included in the appropriate reports; these are listed and referenced at the close of the section describing the summer institute.

Teacher's Manual

This book is essentially divided into five parts, as follows:

1. Theory of inquiry training
2. Guidelines for conducting inquiry training sessions
3. Problem analysis of the sets of twelve films each in physics, economics, and human physiology (biology)
4. Sample protocols
5. Scoring of the inquiry process

The inquiry training staff collaborated in the writing of parts one and two, which provide the teacher with the underlying philosophy and the techniques which carry out the philosophy of the program (Appendix A). The problem analyses of the films consist of introductory remarks, lists of reference texts in the subject matter, a complete script or descriptions of each film, a synopsis of each film, and a thorough breakdown of each film. For example, a breakdown of an economics film would include necessary conditions, assumptions, principles, subproblems, and graphical interpretation. These problem analyses were developed for two other projects, Science Concept Development in the Elementary School through Inquiry Training (Suchman & Carlson) and The Elementary School Training Program in Scientific Inquiry (Suchman, 1962). Part four of the manual, the sample protocols, were transcripts collected during the summer institute for the training of demonstration teams. These provide the teams with examples of inquiry training in the classroom, as well as with notes of practice, lecture, and discussion sessions. The sample protocols are not included in the appendix.

Demonstration Films

During the fall of 1963, some six to twelve hours of footage was filmed of inquiry sessions with sixth-grade gifted children conducted by Dr. J. Richard Suchman. The quality of this footage and of the sound was not as satisfactory as desired. However, two scripts based on the available footage were prepared, containing excerpts from the sessions selected to give the most comprehensive and realistic picture of the process (Appendix B). The scripts are verbatim, unedited transcripts of actual sessions. Film I is entitled Learning to Inquire; Film II, Creating the Conditions for Inquiry. Interpretive comments indicating the characteristics of the children's performance in the inquiry sessions and explaining the basis for each of the teacher's responses were inserted at various points in the film. The films were to be made available to the teams during the school year 1964-65.

The demonstration films were designed to provide parents and educators with a capsule view of inquiry training as it may evolve over an extended period of time. It was found, however, that these films would be better suited to an audience well acquainted with inquiry training, rather than as an overview for parents and teachers not familiar with the approach. Technical difficulties contributed greatly to the failure of these films to fulfill their purpose.

Demonstration Tape Recordings

It was found that the preparation and editing of proposed demonstration tapes would not result in a product that would justify the effort expended on them. In fact, protocols of sessions in which the trainee participated, or which the trainee had observed, proved to be more effective and worthwhile; thus protocols of the summer institute sessions were supplied to the participants, and interpretive comments and analyses grew out of group discussions. These protocols were used instead of demonstration tapes.

The Summer Institute

The summer institute for the training of demonstration teams convened on June 16, 1964, and terminated on July 10, 1964. Participants registered in this graduate level course in elementary education at the University of Illinois, and were able to elect graduate credit of one unit (four semester hours). Although tuition and fees were waived, either the participants or their school districts paid for hospitalization insurance, housing, and transportation. The Urbana public schools provided four classrooms in Thornburn elementary school for the institute activities. Sessions were conducted from 9:00 a.m. to 12:00 p.m., every Tuesday through Friday, for four weeks.

Participants

Of the 30 persons who enrolled in the summer institute, 20 were demonstration team members, 7 were Urbana school teachers, and 3 were University of Illinois graduate students in education. The Urbana teachers were given the opportunity to attend as a service to the Urbana schools, in that the system had cooperated in the completion of a number of other inquiry training programs. These teachers and the three students are now teaching in elementary schools, and applying their inquiry training skills within their classrooms.

In the spring preceding the institute, gifted children enrolled in the intermediate grades of the Urbana schools were invited, through a letter to their parents, to participate in an inquiry training program during the institute. Of those children who elected to attend, 22 were chosen, consisting of 14 boys and 8 girls. The staff presented an orientation meeting that spring to acquaint parents of these children with the methods and materials of the program. The chronological ages of the children ranged from 8.9 to 11.5, and they entered either fifth or sixth grade in the following fall term. The *California Test of Mental Maturity* intelligence scores of the children ranged from 104 to 175. Their achievement on the *California Achievement Test* ranged from 4.9 to 7.7, when tested at the beginning of the previous school term. This test data was compiled by the Urbana schools.

During the institute, the children attended from 10:00 a.m. to 12:00 p.m. for the entire 16 days. Their program was flexible, so that they could be used for demonstration whenever the need arose. When they were not directly involved in institute proceedings, an experienced classroom teacher, Mrs. Josephine Clark, directed their learning in a unit on atomic structure. The unit was prepared and presented in a way that would not interfere with the children's inquiry training. It covered such representative topics as atomic number, atomic weight, electrons, neutrons, protons, atomic splitting, atomic fission and fusion, and putting atoms to work.

The Institute Program

Each morning session was flexibly scheduled to ordinarily include the following activities for the adult participants:

1. A seminar dealing with cognitive and motivational theory relevant to the inquiry process; stress being placed on helping the participants assimilate the theory so that it would become an integral part of their teaching.
2. Demonstrations of inquiry training by the project staff, and supervised practice with groups of children by the participants.
3. Group discussion and individual conferences to provide
    a) an examination of the inquiry training methods and materials
    b) an exchange of ideas with other educators about the implementation of inquiry training
    c) a focus on problems relevant to in-service work with teachers

Demonstrations were tape recorded for the entire four weeks; notetakers recorded the seminars and discussions for the last three weeks. These transcribed proceedings were duplicated for reference in subsequent discussions, and for insertion in each teacher's manual.

In addition to the morning schedule, each team or participant submitted a proposal for a plan to incorporate an inquiry training program into the curriculum of their particular school system. These proposals were discussed at team or individual conferences with the members of the inquiry training staff. When the proposals were approved, final drafts were submitted to the project in preparation for the realization of the plans during the forthcoming school year. Emphasis was placed on team provisions for demonstration and experience.

Tables I, II, III, and IV briefly summarize some of the topics and activities covered during the four weeks of the summer institute. Lectures in the first week served to introduce participants to the extensive background and theory of inquiry training. Second-week lectures included much discussion among the participants and staff members. Initially, the demonstrations were conducted by the staff; at the close of the first week, however, participants began to practice inquiry training techniques themselves. They were divided into four practice groups; at this time the children were likewise divided into four groups after viewing the problem-episode film. Practice sessions took place in four separate classrooms, with at least one staff member present in each room. By rotation, one practice-group member led the inquiry, while another served as notetaker. Each practice was followed by a critique by the staff member and the members of the practice group. On days when only one practice session was held, the groups reconvened for discussion, and the children returned to their classroom teacher. Discussion among all participants did not convene on days when two practice sessions were held until after the groups had two practice sessions followed by practice-group discussions. Some staff members also served as "rovers" between the four groups while a practice session was taking place. Student notetakers recorded protocols of the sessions, and submitted them to the project secretary for duplication; participants added these notes to their teacher's manuals. Each team member conducted at least two inquiry practice sessions. Brief orientation in the content of the problem-episode films was provided for participants during the lecture or discussion periods prior to practice.

The following materials were supplied to participants during the institute:

Reprints of inquiry training publications
Reference texts available in the project offices
Teacher's manuals
Copies of inquiry training classroom materials (i.e., levels-of-explanation sheets)
Protocols of lectures, demonstrations, practice sessions, and discussions

At the close of the institute, each demonstration team received the following (note reference in parentheses to other reports, for complete descriptions):

One set each, of physics (Suchman, 1962) economics, and human physiology problem-episode films (Suchman & Carlson) twelve films per set

A set of thirty ideabooks in each subject matter (Suchman & Carlson)

Thirty copies of the P.C.E. (Predict-Control-Explain) Test of Physics Concepts, with instructions for administration (Suchman, 1962)

A copy of Instructions for the Administration of the Questest (Suchman, 1962), for the evaluation of process

One Black Box and accompanying materials, including Black Box worksheets (Suchman & Carlson)

One copy each of concept tests in physics, economics, and human physiology, with permission to the teams to reproduce them, plus instructions and answer sheets for each test (Suchman & Carlson)

Teams were also asked to plan on the scheduling of demonstration films, to be mailed to them on loan for presentation at demonstration or in-service meetings.

Table I. Summer Institute Schedule
Week One
(June 16 - June 19)

Week One, June 16 - 19			
Tuesday - 16	Wednesday - 17	Thursday - 18	Friday - 19
Lecture Introductory	Lecture Introductory	Lecture Theoretical background Discrepant event Model Adults as inquirers Instruction for demonstration teams	Lecture Ideabooks An inquiry training program Inquiry development Parents & demonstrations An inquiry definition of learning, and objectives Silences Theory vs. explanation
Demonstration Physics #10- "Water Can"	Demonstration Physics #11- "Buoyancy"	Demonstration Physics #20- "Balloon in Vacuum Pump"	Practice Groups Physics #5- "Balloon in Vacuum Pump"
Discussion	Discussion	Discussion	Discussion & Critique (Practice groups)
			Discussion

Table II. Summer Institute Schedule

Week Two

(June 23 - June 26)

Week Two, June 23 - 26			
Tuesday - 23	Wednesday - 24	Thursday - 25	Friday - 26
Lecture Rhetoric of inquiry Operations Operanda Black Box	Lecture	Lecture Intuitive knowledge	Lecture Hypotheses, strategies, and impulsivity Hypothesis testing "Out-of-this World" game and the power of properties
Demonstration Discussion of theories Black Box	Practice Groups Physics #4- "Pulse Glass" Discussion & Critique (Practice groups)	Demonstration Economics #1- "Total Revenue & Total Cost" Ideabooks introduced	Demonstration "Out-of-this World" game Economics #2- "Costs & Output"
Discussion Discussion of demonstration with Black Box Adults inquire Physics #4- "Pulse Glass"	Discussion Adults inquire, Economics problems	Discussion Adults inquire, Economics problems	Discussion Adults inquire, Economics problems Process coding of questions as asked Discussion of guessing, impulsivity, theories

Table III. Summer Institute Schedule

Week Three

(June 30 - July 3)

Week Three, June 30 - July 3			
Tuesday - 30	Wednesday - 1	Thursday - 2	Friday - 3
Lecture	Lecture Cognitive style Kagan's CST administered to adults Operanda	Lecture Group practice tips Levels of explanation & light switch example Question - answering	Lecture
Practice Groups Economics #3- "Size Isn't the Only Factor"	Practice Groups Economics #5- "Competition & Demand (The Industry)	Demonstration Light Switch example, Levels of explanation sheets, and Economics #12- "Staying in Business"	Practice Groups Economics #6- "Competition Affects Profit"
Discussion & Critique (Practice groups)	Discussion & Critique (Practice groups)		Discussion & Critique (Practice groups)
Discussion	Practice Groups Economics #4- "Competition & Demand (The Firm)"	Discussion Group questions on practice: Process structuring & rhetoric Subproblems Role of teacher the first session Tying in the Black Box Silences Social needs & discipline Power of a theory Questions about demonstration	Practice Groups Economics #7- "Profits Depend Upon Other Products"
	Discussion & Critique (Practice groups)		Discussion & Critique (Practice groups)
	Discussion Discussion of Kagan's test Verification, vs. explanation Leveling & Sharpening (Gardner) Generalization & models Thurstone's test		Discussion Cognitive style & anxiety Creativity Autonomy

Table IV. Summer Institute Schedule
Week Four
(July 7 - July 10)

Week Four, July 7 - 10			
Tuesday - 7	Wednesday - 8	Thursday - 9	Friday - 10
Lecture Analysis of Questest protocol Practice groups -structure & function	Lecture	Lecture	Lecture Integrating inquiry into the curriculum Viewed demonstration films I & II
Practice Groups Physiology #1- "Feeling Temperature"	Practice Groups Physiology #2- "Feeling Pressure"	Practice Groups Physiology #4- "Muscle Strength"	Demonstration Physiology #6- "Oxygen Consumption"
Discussion & Critique (Practice groups)	Discussion & Critique (Practice groups)	Discussion & Critique (Practice groups)	Discussion Questions about demonstration films
Discussion Coding of Questest protocol by participants Discussion of practice groups Levels of explanation Ideabooks	Practice Groups Physiology #3- "Hearing"	Practice Groups Physiology #5- "Vision"	
	Discussion & Critique (Practice groups)	Discussion & Critique (Practice groups)	
	Discussion Adults practice answering questions about inquiry, for demonstration practice	Discussion Adults practice answering questions about inquiry, for demonstration practice	

The Institute in Retrospect

Evaluation of the summer institute by staff members and participants suggested the following:

1. The theoretical aspects of inquiry training were effectively assimilated by the participants because of immediate, daily opportunities to relate the theoretical to the practical situations. Lectures followed by demonstrations, with discussions intended to integrate the real and ideal, to deepen understandings.
2. Similarly, the active involvement of participants during lectures, discussions, and demonstrations facilitated learning and comprehension.
3. The protocols which were provided for the majority of the sessions served as worthwhile reviews, both during the institute and during the subsequent school year.
4. The opportunity for participants to practice with children was perhaps the most significant activity of the institute. The inquiry method requires a radical departure from the usual teaching style; thus, the participants were faced with changing teaching behaviors that were deeply ingrained habits. Even more practice sessions were necessary, but time and resources were limited. It was agreed that frequent repeated experiences with children, critiqued by a trained observer, would enable the teacher to recognize and restructure his behavior so that the objectives of inquiry training could actually be met.

San Francisco State College Workshop

An inquiry training workshop was conducted by Dr. J. Richard Suchman, Dr. Rosslyn Suchman, and Mr. Charles Lavaroni at San Francisco State College, San Francisco, California, from August 3 through August 28, 1964. The 48 participants enrolled in this credit course were trained, but not required to establish demonstration centers. The workshop was co-sponsored with San Francisco State College by the California State Department of Education and the U. S. Office of Education. The program resembled that of the University of Illinois summer institute, including the following:

1. Lecture-discussion sessions which allowed participants mainly interested in inquiry in the primary grades to work in a separate group with Dr. Rosslyn Suchman, while Dr. J. R. Suchman worked with the others
2. Opportunities for participants to observe inquiry training with 30 fifth-grade through eighth-grade children
3. Opportunities for participants to practice newly acquired techniques on fifth-grade through eighth-grade children. Each participant was formally critiqued by his practice group, as well as receiving individual comments from the staff
4. Reaction-discussion session similar in content to those at the University of Illinois
5. Each participant submitted a written proposal suggesting how inquiry training could be used in his particular situation

CHAPTER III

OPERATION OF THE DEMONSTRATION CENTERS

During the school year of 1964-65, the eleven demonstration teams conducted inquiry training programs within their respective school districts. The staff of the University of Illinois demonstration center served as consultants and administrators, providing specific services to integrate the Midwest Centers.

Staff Visits

A total of 27 visits to teams, or an average of about two visits per team, were made by individuals on the staff of the University of Illinois demonstration center. Each visit usually entailed (1) extensive discussion of the team's progress, (2) observation by the staff member of a team member conducting an inquiry training session, and (3) a critique of the session by the staff member. A carbon copy of notes taken by the staff member was presented to the team after the session; these notes were referred to during the critique. Following the visit, the staff member's copy of the comments were attached to a report of the visit.

Visit reports were completed by the staff member on a four-page outline, and then typed in duplicate. The reports were filed for reference, and served as records of team progress. Notes from the reports contributed to newsletter articles, also. The outline of each visit report covered the following topics:

- Date
- School
- Team
- Visitor
- Physical plant of the school
- The plan
    - Number of pupils

    - Selection of pupils
    - Program
        - Content
        - Goals
        - Time it meets
    - How does it compare with the proposed plan?
- Understanding the project
    - Process
    - Content
- Attitude of
    - Children
    - Teachers
- Philosophy of the school and their attitude toward the project
- Use of materials
- Other materials
- Criticisms given
- Future plans
    - Dates for
        - Visits
        - Films
    - Plans for in-service training
    - Involvement of public
- Miscellaneous
    - Other people you saw
    - Newsletter possibilities
    - Directions to the school

Phone visits between teams and staff members were frequent, and these were briefly recorded on phone visit report forms. Staff advice and the dissemination of inquiry training materials from the project center were achieved through regular correspondence. At intervals, teams were sent brief outlines to be returned to the project which were intended to update information about the demonstration programs.

Newsletters

Six issues of a newsletter were printed and distributed throughout the school year to demonstration teams (Appendix C). The first issue of the newsletter was mailed to persons on the project mailing list; some subscriptions were presented with no charge to individuals directly involved in the demonstration of inquiry training or serving as consultants to the project. Including team members and their district administrators, approximately fifty newsletter subscriptions were complementary. Approximately one hundred sixty-five subscriptions were purchased at one dollar for the six issues; this price covered the costs of printing.

Widespread distribution of the newsletter promoted the further dissemination of inquiry training theory, techniques, and materials. The newsletter was intended to renew understandings which the team members acquired during the summer institute, to deepen these understandings, to acquaint others with inquiry training, and to integrate the operations of the various demonstration teams through an exchange of ideas.

Demonstration Films

The two films developed to facilitate the demonstration of inquiry training were scheduled for loan to the teams. Since the films were not entirely satisfactory, the teams used answer prints, and not the final release prints. The demonstration films were shown to approximately 14 audiences. The quality of the films, however, did not encourage frequent use, since live demonstrations served to more effectively communicate the inquiry training program to others.

Staff Demonstration and Speeches

Members of the University of Illinois project staff presented several speeches and demonstrations. These were usually held in or near areas in which demonstration teams were functioning, thus furthering the objective of dissemination. Programs featuring a staff member both demonstrating and speaking consisted of the following:

Illinois Junior High School Drive-in Conference in Decatur, Illinois

Closed-circuit television demonstration and lecture to an extension class of graduate students in Skokie, Illinois

District institute for teachers and administrators, in Naperville, Illinois

Association for Childhood Education meeting in Decatur, Illinois

Teacher's institute in Elk Grove Schools, Illinois

Annual meeting of the Illinois Junior High School Association, University of Illinois

A total of approximately seven speeches were given to the parents of children involved in inquiry training in University City, Missouri, and Canton, Ohio; to faculty of Centennial Junior High School, Decatur, Illinois; to an inquiry training workshop for district principals, Canton, Ohio; and to three University of Illinois classes, two undergraduate, and two graduate.

A great deal of interest in the program was stimulated during the four-day seminar on "Teaching as Inquiry" conducted by Dr. Suchman and the inquiry training staff at the meeting of the A.S.C.D. (Association for Supervision and Curriculum Development), in Chicago from February 28 through March 3. Although attendance was to be the official enrollment of fifty-two educators, approximately one hundred persons were present at the sessions. Of value in extending the understandings of the participants were three demonstrations with a group of children, and an opportunity for some of the participants to work with a small group of children on an inquiry problem.

Dissemination of Materials

A rough approximation of the increasing number of inquiry training materials made available during the school year, 1964-65 to persons corresponding with the University of Illinois office, follows:

Material Sales

37 individual physics films
7 sets of physics films (12 per set)
336 physics ideabooks
10 individual economics films
9 sets of economics films (12 per set)
349 economics ideabooks
10 individual physiology films (12 per set)
325 physiology ideabooks
308 copies of the 1962 report,
The Elementary School Training Program in Scientific Inquiry

Complementary Materials

3,536 individual reprints

Materials Used in Project Study

1,091 ideabooks
40 sets of films from three content areas

A considerable amount of correspondence, difficult to estimate, also provided suggestions and information.

Midwest Demonstration Centers

Each demonstration team created an inquiry training program, as was expected, that reflected the individual school system. It was the prerogative of the local school district to establish a demonstration center that would best serve its needs. Each center was obligated to meet two requirements, however. One requirement was to provide the opportunity for other educators to visit the center and observe inquiry training in operation; the second, was to furnish the leadership team with the time and equipment to practice techniques and to prepare for the future training of other educators.

In order to accurately report the 1964-65 activities of each demonstration center, the teams were asked to submit their own reports about their individual programs. The reports which follow serve also to give recognition to the efforts and achievements of these teams.

ILLINOIS

Arlington Heights

Demonstration team

Ethan Janove, principal
Ruth Lang, fifth-grade teacher

School district

Community Consolidated School District #59
Arlington Heights, Illinois

In 1957 there was one school in the district and by 1965 there will be 13 schools with many of them being enlarged with additions. In the school year 1964-65 there were 6,100 pupils and by the fall of 1965 the school district expects 1,400 more. Arlington Heights is a fast growing suburb of Chicago. Being incorporated into the school district are programs in connection with Project Headstart, the ungraded primary, team teaching, independent study center, etc.

School in which inquiry training was conducted

Brentwood Elementary School, Elk Grove

Pupils

Total number of pupils: 74
Number of pupils per group: 10 to 15 per group
Selection of pupils: All fifth-grade children received inquiry training.

They were grouped by I.Q.'s secured from the Iowa tests of basic skills and the Lorge-Thorndike test of intelligence and by subjective evaluation into four groups; the top group comprised the "gifted" children. In the early spring the children were regrouped by their choice. At the writing of this report, the team planned to regroup the children by inquiry style.

A group of bright second and third graders are being used to demonstrate in an in-service program.

Description of pupils: The majority of the children are middle-class, living in a "typical" suburban community northwest of Chicago. Ten of them live in a trailer park and represent a lower socio-economic status.

Program

Schedule

Dates covered by entire program: Fifth-grade groups, from November, 1964, until June, 1965; the second/third grade group started in March and will continue until June.

Number of meetings: Fifth-graders, twice per week; second/third grade, once per week. All sessions run for forty-five to sixty minutes.

Description of program

The inquiry training program included the three sets of films, Black Boxes, ideabooks, and physics problems illustrated on cards. Inquiry has been conducted as a special subject and not as part of the regular curriculum.

Demonstration activities during the 1964-65 school year

Visits and/or publicity

There were over one hundred visitors from Nebraska, Wisconsin, and Illinois. The majority were teachers visiting the school district who were directed to Brentwood. There has been complete cooperation from the administration in this area. Visitor groups have ranged in size from one to twenty-nine. They were able to observe two groups each visit. There was no orientation before the demonstration; after the children's session, visitors were allowed to inquire. The principal and teacher handled these meetings.

The DesPlaines' newspaper printed an article, "District #59 to Introduce Inquiry Training Program," which described Brentwood's program, the summer institute, inquiry training, and pictured the team members.

Demonstrations and/or speeches

Five demonstrations and speeches were presented to such groups as the Board of Education, Unitarian Church, North Shore of Jewish Studies, principals' meetings, and P.T.A.s, as well as an institute for the teachers of the district.

Teacher training

In the fall on Institute Day, November 6, the team members from Elk Grove, a team member from Evanston and a staff member from the University of Illinois office combined to present a half-day workshop for teachers, grades 2-6. The school district wanted to orient all of the teachers in regards to inquiry training.

One of the Elk Grove team members also conducted a six-week workshop where seven teachers viewed and became acquainted with the inquiry training process and procedure. The seven teachers met after school once a week for an hour and a half. Arrangements were made for a group of second and third graders to be present so that the team members could give a live demonstration. All of the participants in the workshop worked with the children at various times.

Evaluation of the program

Subjective evaluation

The major change appears to be in the children's behavior, in the regular class setting as well as in inquiry sessions--they appear to be more autonomous and more willing to explore than before. We do not feel that they have gained much in the formation of concepts, or in the process of inquiry. This may be due to the teachers, or the children.

Future plans for inquiry training

If funds are not obtain for in-service and/or summer institutes, the team will continue to partially train district teachers who are interested.

Continuation of inquiry program

Tentative plans for the following year may have used inquiry training as the basis of a science program. Inquiry training will have been conducted with third, fourth, and fifth graders.

Special problems

Films appear to be "over their heads." This may be the particular set of fifth graders. They are quite weak in concepts, plus their original attitude toward school was, "Entertain me."

There was much difficulty in making them aware of process.

Submitted by: Ethan Janove
Ruth Lang

Decatur

Demonstration team

William K. Williams, assistant principal
Mason R. Rhue, teacher of English and social studies

School district

Decatur Public Schools, District #61
Decatur, Illinois

Second-largest school district in the state of Illinois; consists of 27 grade schools, 5 junior high schools, and 4 senior high schools. Number of students: 20,000.

School in which inquiry training was conducted

Centennial Junior High School

Pupils

Total number of pupils: 38
Number of pupils per group: 22 in seventh-grade group
16 in eighth-grade group
Selection and description of pupils:

Identification of Participants

Criteria used in identification of participants:

1. California Test of Mental Maturity (eighth grade only)
2. Otis Quick Scoring (seventh grade only)
3. Teacher check list (SRA - DeHann's list)
4. Honor Roll (eighth grade only)
5. Number of times chosen by different teachers in check list (eighth grade only)
6. Stanford Achievement

Eighth-Grade Students

A letter and a check list were sent to each of our Centennial teachers. Approximately 40 check lists were received from the teachers. In the case of the eighth graders, some were recommended five times by different teachers.

After recommendations from teachers, test results were scanned as well as the honor roll, and a work sheet was constructed by the team. It contained the name, home room, section number, number of times chosen, CTMM language and non-language, and total, of the Stanford Achievement scores. After deleting a number of individuals, a total of 27 individuals was listed (16 boys and 11 girls). From this list 16 individuals were chosen.

Seventh-Grade Students

A letter and a number of check lists were sent to each seventh-grade teacher and to the principals of our feeder schools. Two of these schools reported no student fitting any of our criteria. The reamining feeder schools reported 38 individuals.

The team visited each feeder school for the following purposes: to acquaint them with the individual's scholastic and cummulative folder, to have a conference with the individual's sixth-grade teacher, and to observe the individual in a classroom situation.

A work sheet was constructed in which the names, school, Otis Beta, and Stanford Achievement results were listed. From this information, a number of names were deleted and 22 were selected.

Program

Schedule

Dates covered by entire program: September 8, 1964 to June 8, 1965

Number of meetings: One meeting per group per week, for a 47-minute period of time

Description of program

With both groups, all physics films were covered. The eighth-grade group covered the majority of economics films, and no physiology films; the seventh-grade group did not cover the economics films, and covered half of the physiology films. Ideabooks were used in all sessions with companion films. The "Out-of-this-World" game, other discrepant events, and the Black Box were used for both sections.

Changes made in the program

Sounds recorded on tape were experimentally used as discrepant events with both classes. This technique was judged as very successful.

Other uses of inquiry training in the curriculum

Inquiry was occasionally conducted with three other groups:
- Seventh-grade slow-moving group
- Eighth-grade slow-moving group
- One E.M.H. group of junior high level

Demonstration activities during the 1964-65 school year

Visits and/or publicity

Visitors observed classroom inquiry sessions by invitation to all faculty members and to other interested parties. A visitor was usually present at each period. Any interested persons were welcome to observe at any time. Follow-up conferences were always held before visitors left the school.

Two articles were printed in the local newspaper, Decatur Herald. The first, "Decatur Plans Center for Gifted Students" included a photograph of the demonstration team, and an announcement of the forthcoming summer institute and fall inquiry training program. The second article, "Inquiry Training Teaches Students How to Learn," reported the Drive-In Conference, and discussed the Inquiry Training program and its application in the Decatur Schools.

Demonstrations and/or speeches

Several demonstrations were given during the school year, to such groups as the Illinois Junior High School Association Drive-In Conference, P.T.A. meetings, faculties of other schools, and parents of participating students.

Teacher training

The entire faculty undertook observation, and some attempted to demonstrate.

Evaluation of the program

Subjective evaluation

For the most part, the program has been well-received throughout the school district. Students participating have been enthusiastic, as have been the instructors, administrations and teachers.

The use of sounds as discrepant events seemed successful with regard to the responses of all students.

Future plans for inquiry training

Teacher training

A workshop was being planned for the summer of 1965.
Approximate dates: August 2 to August 17, 1965
Schedule: Full-day sessions
Location: Decatur, Illinois
Sponsor: District #61
Source of funds or support: Gifted General Support
Staff: Mr. Williams and Mr. Rhue, plus twelve support members
Participants: Educators at the secondary level, possibly including all levels
Program: Patterned after the University of Illinois 1964 summer institute.
Materials used: Same as used at the University of Illinois institute.

Continuation of inquiry training program

The same program as was in effect this year at Centennial Junior High School

Submitted by: William K. Williams
Mason R. Rhue

Evanston

Demonstration team

Thomas A. Sinks, principal
Jeremiah Floyd, teacher

School district

Community Consolidated School District #65
Evanston, Illinois

Evanston is a suburb of Chicago of approximately 80,000 people. There are around 12,000 children in grades K-8. Northwestern University is located in Evanston and exerts a great deal of influence on the school system.

School in which inquiry training was conducted

Nichols Junior High School

Pupils

Total number of pupils: 18
Number of pupils per group: 18
Selection of pupils: The children were selected on a voluntary basis from a group containing all students assigned to accelerated mathematics classes in this school at the eighth-grade level.

An additional group of twenty youngsters were selected at random for a limited exposure to some specific physics problems.

Program

Schedule

Dates covered by entire program: September, 1964 to June, 1965

Number of meetings: Class meetings were held twice a week for fifty minutes duration.

Description of program

The materials used were as follows:

- a. One set of physics films and ideabooks
- b. One set of economics films and ideabooks
- c. One set of physiological films and ideabooks
- d. One set of physics problems illustrated on cards
- e. One set of mathematics problems presented on paper

Changes made in the program

The only changes made in the program during the year centered around the sequence of presenting the films and other materials. The physics problems were displayed on cards at the completion of the economics film series. All of the physiological series were presented, but the recommended order of presentation was not followed. All films with the same or related principles were shown in sequential order. The last eight meetings were used to present mathematics concepts for inquiry purposes.

Other uses of inquiry training in the curriculum

The Science Department incorporated the inquiry process in presenting some concepts in several of their science units.

Jeremiah Floyd also developed some problems in connection with the "New Math" which were used to present mathematical concepts for inquiry purposes.

Toward the end of the school year, an E.M.H. class was exposed to inquiry training. The children responded enthusiastically as did their classroom teacher. With help from the team members the classroom teacher has been conducting some inquiry training sessions.

Demonstration activities during the 1964-65 school year

Visitors and/or publicity

Visitors regularly attended the demonstration class. These were composed mainly of teachers, administrators, and supervisors from our own school district. However, some visitors who came in were interested parents and members of the general public. As of this writing, one visit has been scheduled for a representative from an educational research firm.

Two newspaper articles were published in the local newspaper, The Evanston Review, complete with photographs, about the work of the demonstration center. Other publicity was provided through the use of the District 65 Newsletter which is disseminated, monthly, to all educators in the district. Additional publicity was obtained through the Outlook, a weekly newsletter which goes to every parent in the school district.

Demonstrations and/or speeches

October 4, 1965--Live demonstration at our Board of Education Building for all administrators and supervisors of District 65

November, 1964--Presentation of film "Creating Conditions for Inquiry"
- --Nichols Junior High School Faculty Meeting
- --Nichols Junior High School PTA
- --College Hill Elementary School Staff
- --Dawes School Staff
- --Oakton School Staff

March 23, 1965--Presentation of film "Inquiry Training" for all Junior High School personnel in District #65. Physics film #31 "The Balloon and Vacuum Pump" was also used with small groups to provide an opportunity for teachers themselves to inquire. This was a part of an Institute Day program.

November 6, 1965--Group discussion leader at Elk Grove Village, District #59, for an Institute Day program

Participants in an Institute Day program, January 18, 1965, at Winnetka, Illinois

March 2, 1965--Participants in demonstration sessions at ASCD convention, Chicago, Illinois

Evaluation of the program

Subject evaluation

Both team members remained enthusiastic throughout the year. The children and their parents were very interested at the beginning but interest began to wane with one-third of the children about mid-year.

Future plans for inquiry training

Continuation of inquiry training program

The team hoped to offer inquiry training as an elective activity next school year. Preliminary plans call for changing groups after the first semester in order to provide this training to the maximum number of students possible.

In addition they planned to review the experiences of the members of our Science Department and coordinate our efforts to insure maximum effectiveness.

Finally, they hoped to work with one of our teachers who teaches a class for the Educable Mentally Handicapped in presenting some science concepts. The team felt that the inquiry process has merit for this level as well as with the gifted, and hoped to do some experimentation with it.

Submitted by: Thomas A. Sinks
Jeremiah Floyd

Lincolnwood

Demonstration team

Richard F. Powers, principal
Jack Lowry, teacher

School District

Lincolnwood School District #74
Lincolnwood, Illinois

Lincolnwood schools are located on grounds which have a "campus look"; the three schools within one quadrangle house the primary grades (Todd Hall), the intermediate grades (Ruthedge Hall), and the upper grades and junior high school (Lincoln Hall). In 1963, slightly over 2,000 pupils were enrolled in Lincolnwood schools, with an average class size of 27½. The village of Lincolnwood is located 13 miles northwest of Chicago's Loop. Its population of 13,000 comprises people with above average income and education.

School in which inquiry training was conducted

Lincoln Hall Junior High School

Pupils

Total number of pupils: 18 first semester; 12 second semester

Number of pupils per group: One group of 6th, 7th, and 8th grade children.

Selection of pupils: A list of over 60 pupils was compiled on the basis of high I.Q. scores on the Lorge-Thorndike test of intelligence and teacher ratings. These pupils were given the opportunity to sign up for the inquiry class; 43 signed up. The teacher then selected the 18 students after again consulting with the classroom teachers.

Program

Schedule

Dates covered by entire program: September, 1964 to June, 1965

Number of meetings: The program was offered twice a week during activity period of the first semester and once a week the second semester for 40 minutes per session.

Description of program

Mr. Lowry used the three sets of films and ideabooks the first semester and only the economic films and ideabooks the second semester. The Black Box and the light switch idea were utilized both semesters.

Other uses of inquiry training in the curriculum

Science teachers in seventh and eighth grades have conducted inquiry sessions without the use of films and with the intention of learning a principle at the end of a session.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

Visitors were invited on a informal basis to observe inquiry training in the classroom. A number of teachers and administrators took advantage of this opportunity.

Demonstrations and/or speeches

In the fall, the inquiry training program was briefly explained to the P.T.A., when either aspects of the school's activity period were also discussed. In January, Mr. Lowry demonstrated for school board members and parents of the inquiry training students.

The demonstration films were shown at a teachers' institute in February.

Evaluation of the program

Subjective evaluation

Most of the students took readily to the problems and remained interested as long as problems seemed puzzling. Eighth graders, particularly, thought that the physiology films were simple. No amount of posing sub-problems or of rephrasing questions seemed to help. Economics worked best since students hadn't been taught this in school. A few students progressed to the point where they were distinguishing between various levels of theory.

Submitted by: Richard F. Powers
Jack Lowry

Palatine

Demonstration team

Jordan Vogel, sixth-grade core teaching of special opportunities class (Carl Sandburg Jr. High School)
Donald H. Riek, science teacher for special opportunities class (Stuart R. Paddock School)

School district

Community Consolidated School District #15
Palatine, Illinois

District 15 is located about 35 miles northwest of Chicago. It is suburban, residential in character with most homes belonging to the middle to upper socio-economic level. Two communities lie within the district, Rolling Meadows, population 8,000 and Palatine, population 12,500. Many residents commute to Chicago. The school district is growing very rapidly, from 2 schools in 1954 to 13 in 1964. The student population now stands at over 8,000. There is some light industry, but almost no transient pupils.

Schools in which inquiry training was conducted

Carl Sandburg Junior High School, Rolling Meadows
Stuart R. Paddock School, Palatine

Pupils

Total number of pupils: 49
Number of pupils per group: Sandburg, 24; Paddock, 25
Selection of pupils: Teacher recommendation and the Stanford-Binet and C.T.M.M. tests (over 140 I.Q. as criterion)
Description of pupils: Middle to upper-middle socio-economic class

Program

Schedule
Date covered by entire program: Sandburg, entire school year; Paddock, month of January
Number of meetings: Sandburg, varied; Paddock, five per week, maximum of 43-minute session

Description of program

Sandburg used all three sets of inquiry training films, ideabooks, and the Black Box. Paddock covered all physics films, supplemented by physics ideabooks.

Other uses of inquiry training in the curriculum

Mr. Vogel, at Sandburg, adapted inquiry training to social studies. In teaching history, Mr. Vogel presented data, and asked the students to formulate theories, with consideration to

to the verification of, and experimentation with, properties of society which might precipitate an historical event.
Mr. Riek, at Paddock, incorporated inquiry training in physics into a program for two slow and one fast eighth-grade science sections.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

Classes were visited by administrative and teacher invitation. Visitors were present two to three times per month, with approximately 25 during the year at Sandburg; 4, at Paddock.

Demonstrations and/or speeches

Three demonstrations were presented to administrators and faculty. One speech was given, without demonstration, to the science faculty.

Evaluation of the program

Objective evaluation

Tests and questionnaires were administered to the children and their parents, for follow-up.

Results: Student evaluation:

One student out of a sixth-grade gifted section and one student out of a slow eighth-grade section would have preferred the more traditional type of teaching because they felt they were losing out content-wise. Many thought inquiry training was "harder." One eighth-grade student from a faster section said, "It was the most fun I've had all year."

About 98% of all the students from the five sections in which inquiry training was provided stated they would like more inquiry training sessions and about the same percentage when given the choice of an inquiry training session or a traditional teaching session chose inquiry training.

Parent evaluations:

The parents of a sixth-grade gifted section were asked to evaluate the year's work (which included 20 inquiry training sessions). The comments were overwhelmingly favorable. There were no adverse comments concerning inquiry training.

Subjective evaluation

Mr. Riek tried inquiry training with one sixth-grade gifted section, two eighth-grade fast sections and two eighth-grade slow sections. He found, somewhat contrary to his expectations, that it worked very well with the slow sections (you do not have to be a good reader to be an active participant in inquiry training).

As observed by the two teachers, the students went through several transitions:

1. Thought "twenty questions" was interesting and fun.
2. Thought that self-examination of questions hard and boring.
3. Thought that they were not accomplishing anything because the answers were not given.
4. Thought that inquiry was interesting and productive (about one-half of the students have entered this stage.)

We found that some children are able to formulate experiments more easily while manupulating objects. This may not be true with gifted students, but was helpful in this class. As an example, the cartesian diver was demonstrated as recalled from an inquiry film presentation and children formed groups of two's, three's, and four's for experimentation of their own designs. Jars of different heights, widths and openings were provided as well as different size test tubes to use as divers. Balloons and rubber bands served as diaphragms.

Future plans for inquiry training

Teacher training:
Workshop
Approximate dates: Early September, 1965
Sponsor: District #15
Source of funds or support: District #15
Staff: Mr. Marion Omiatek, Director of Instruction and Mr. Riek
Participants: School principals and faculty
Program: Lectures, discussions, and demonstrations
Materials to be used: Physics films and ideabooks

Continuation of inquiry training program:

The same program as used at Paddock school was to be conducted at Paddock the following year, with the addition of inquiry training biology films in the sixth-grade special opportunities class, and the physics films in four eighth-grade science classes; the objective of the program was that other teachers become involved in inquiry training.

Mr. Vogel will no longer be in the school district.

Submitted by: Jordan Vogel
Donald H. Riek

Park Forest

Demonstration team

Wesley Pruitt, principal
Franziska Naughton, teacher

School district

Park Forest School District #163
Park Forest, Illinois

Park Forest is considered a suburb of Chicago with a transient population of 30,000. There are approximately 4,500 children enrolled in Park Forest schools. The following are some of the organizational patterns and programs being incorporated within Park Forest School District - ITA, a modified Joplin reading program, and cooperative teaching.

School in which inquiry training was conducted

Mohawk School

Pupils

Total number of pupils: 39

Number of pupils per group:		
	Group A:	16 sixth graders
	Group B:	14 fifth graders
	Group C:	9 fifth graders

Selection of pupils: Pupils in Group A and B were selected from achievement test scores in reading and arithmetic and intelligence test scores. Group C students were selected by the fifth-grade teachers on the basis of (1) curiosity displayed in classroom discussion, (2) particular interest in science, and (3) enthusiasm for new learning experience.

Description of pupils: Most of the pupils were from middle-class socio-economic origins. They were achieving from a year to a year and one-half above their grade level in reading and arithmetic and their I.Q.'s ranged from 124 to 140.

Group C was made up of students of average achievement and ability. Several students were chronic underachievers in classroom performance for emotional reasons, but each retained a lively curiosity. Another boy was a social isolate, but he participated actively in class discussion. The five girls were of average ability but very extroverted.

Program

Schedule

Dates covered by entire program: September, 1964 to June, 1965

Number of meetings: Groups A and B met once a week for a period of one hour. Group C started later and met twice a week for one-half hour then combined with Group B to meet once a week.

Description of the program

All physics and biology films were seen. The Black Box was introduced in October when there was a need to return to the concrete level and has been used intermittently since that time for process structuring. Several discrepant situations were introduced independently through demonstrations and current events. The economics filsm were used April through June.

Changes in the program

Group C started as an experimental group to determine the difference between growth in inquiry for average ability students with outgoing qualities (less threatened by grades and class expectancies). This group proved so stimulating that it was incorporated into Group B and the final group combined for scheduling purposes.

Other uses of inquiry training in the curriculum

Several social studies problems were presented under the framework of inquiry training (at the fifth grade level).

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

Visitors observed approximately once or twice per month. All teachers in the district were invited through staff meetings, newspaper releases, and personal communications. Approximately 30 people visited the demonstration sessions. Anyone who wanted to was encouraged to attend. Information sheets were distributed prior to the class session and time for questions was provided after the conclusion of the class period.

An article appeared early last fall in the Park Forest newspaper describing the inquiry program for the year at Mohawk School. In Teaching Early Adolescents to Think, edited by M. Dale Baughman, sponsored by the Jr. High School Association of Illinois, published by Interstate Printers and Publishers, Inc., Danville, Illinois, the article "The 'Inquiry Training' Program at Mohawk School, Park Forest, Illinois" written by team members from Park Forest was published.

Demonstrations and/or speeches

Demonstrations during the first year included the following:

1. Parents or inquiry training students were shown an inquiry film and participated in an adult inquiry session.
2. A group of teachers ran a mock inquiry session for the Board of Education during a report on the technique to the Board.
3. One demonstration was given to the South Suburban Curriculum Association using a group of students from Country Club Hills School District.
4. Six speeches were given without the use of pupils.

5. The problem-episode films were used on several occasions to demonstrate the level of difficulty of the problems, to show the information with which a pupil started, and to precede an inquiry kind of interaction with an audience.

Evaluation of the program

Objective evaluation

No objective evaluation was attempted.

Subjective evaluation

Subjective evaluation considered the value of a mixed ability group; i.e., the classroom, enthusiastic and curious students were catalysts to the entire group. There seem to be two major problems: (1) many students found it very difficult to break away from correct-answer orientation, and (2) students with little science background found it difficult to explore for more useful theories. The teacher, however, found that she was becoming more sensitive to the intellectual needs of the students as they were expressed through questioning.

Future plans for inquiry training

No teacher training is envisioned at this time.

Continuation of inquiry training program

Next year, a group of lower socio-economic pupils will have undergone training in inquiry. The group was to have been the total class (approx. 22 pupils) in the sixth grade, with a program similar to that of the first year.

Special problems

There is considerable difficulty in scheduling small groups that are taken out of several regular classrooms. The regular classroom teachers are reluctant to lose their top students. This can be resolved through the incorporation of appropriate inquiry techniques into the regular classroom. Another year of experimentation under the changed conditions described above may provide more practical suggestions for this.

Submitted by: Wesley Pruitt
Franziska Naughton

MICHIGAN

Lansing

Demonstration team

John Anderson, graduate student, Michigan State University, and supervisor of student teachers
Kenneth C. Woodward, teacher

School district

Lansing Public Schools
Lansing, Michigan

The school system is closely associated with Michigan State University in East Lansing, serving as a principle training ground for the university teacher training program. The district enrollment is approximately 14,000 students. The area which the schools serve is lower middle class, with skilled and unskilled production workers.

School in which the inquiry training was conducted

C. W. Otto Junior High School

Pupils

Total number of pupils: 30
Number of pupils per group: One group of seventh-grade pupils
Selection of pupils:

A heterogeneous science class, because the school system does not group children by ability. The team member began the inquiry training program after classes were established.

Description of pupils

The teacher and Lansing curriculum director felt that this group was less responsive than a average seventh-grade group.

Program

Schedule

Dates covered by entire program: January 3, 1965 to June 3, 1965

Number of meetings: One meeting per week, periods during the second or third hour of the day; flexible, in that periods could run over into the third hour. The meetings averaged about 45 minutes per week.

Description of program

Physics (1 through 12) and physiology (1 through 11) films and ideabooks of the inquiry training program. The class was occasionally divided into two groups of 15 students each.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

Visitors were invited to the classroom, and parents were invited later in the school year. The three science team teachers at this junior high school, plus one student teacher, were involved in the inquiry program. Visitors included the following: science curriculum directors of Lansing and Jackson, Michigan; several audio-visual specialists and several teachers. A professor of audio-visual aids from Michigan State University previewed the films, and the science and curriculum departments of the College of Education reviewed the films, equipment, and program.

Demonstrations and/or speeches

A demonstration was presented to a sectional meeting of the Michigan Science Teachers Association Convention which was held in Lansing, Michigan, on March 6.

Teacher training

The classroom teacher observed each session, and eventually conducted some sessions with direction from the team member.

Evaluation of the program

Objective evaluation

The PCE Test of Physics Concepts was given January 7, 1965, and the same test was given again at the end of the school year (June 3, 1965) to compare the scores at the beginning and at the end of inquiry training. Of the 24 pupils completing both tests, 21 improved their scores significantly, 1 retained the same score and 2 dropped in the total score.

Future plans for inquiry training

No future plans were being made for formal inquiry sessions. Some of the principles and ideas from the inquiry approach were to be used in Mr. Woodward's seventh-grade science classes the next year. He will have attempted to correlate this with regular classroom work.

Submitted by: Kenneth C. Woodward
John Anderson

Livonia

Demonstration team

Clyde L. Jack, principal
Miron Stolaruk, administrative intern, Cleveland Elementary School

School district

Livonia, Michigan

Suburb of Detroit, with 80,000 total population. Kennedy School has an enrollment of 576 pupils.

School in which inquiry training was conducted

Kennedy Elementary School

Pupils

Total number of pupils: 18
Number of pupils per group: One group
Selection of pupils: The group was selected by classroom teachers who recommended pupils who could afford to miss regular classroom instruction for one hour per week.
Description of pupils: Children were from the upper middle class, average to above in achievement, from the fourth, fifth, and sixth grades.

Program

Schedule
Dates covered by entire program: October, 1964 to May, 1965
Number of meetings: Two meetings per week, one hour sessions.

Description of the program

Films and ideabooks in physics, economics, and physiology were used, as well as the Black Box.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

A few people visited the classroom during the school year.

Demonstrations and/or speeches

Demonstrations were presented to the following:

1 group junior high science teachers
2 parent groups
2 student teacher groups
1 elementary principal group
1 reading council
1 Michigan ASCD Drive In Conference
5 elementary school staffs
1 summer science teachers workshop.

Demonstration films were used in presenting inquiry training to the summer science teachers' workshop.

A team member was also involved as a panel member at two different meetings for people who were looking at inquiry of different approaches as a method of instruction.

Evaluation of the program

Objective evaluation

The P.C.E. test was given to the students as a pretest and postest in physics. Class improvement was shown.

Subjective evaluation

During the first and last few sessions of inquiry training a tape recorder was used to record the sessions. The teachers' evaluation of the tape recording indicated that class improvement was shown in all three areas. The attitudes and involvement of individual children toward inquiry training seemed to govern their improvement.

People who have seen the demonstrations feel it is worthwhile to use inquiry in teaching children. Their biggest concern was the use of inquiry with large classloads. They wanted to know how to adopt it to classroom use.

Future plans for inquiry training

Livonia school district conducted two three-week summer school sessions, including inquiry training in the program as an enrichment activity. There were approximately 20 pupils per session, meeting 5 days a week for 2½ hours a day.

Continuation of inquiry training program

The program completed during the past school year was to be continued in perhaps two schools. The team also conducted an inquiry training class in physics during the summer of 1965.

Special problems

The team felt that they had difficulty in identifying cognitive style.

Submitted by: Clyde L. Jack
Miron Stolaruk

River Rouge

Demonstration team

Frederic A. Rivkin, teacher

School district

River Rouge Public Schools
River Rouge, Michigan

The River Rouge Public Schools is a suburb of Detroit with a population of approximately 22,000. The city can be described as a lower socio-economic industrial community. Its inhabitants are employed mainly in factory and other blue collar kinds of work. The school district has four elementary schools (K-7) and one high school (8-12). Enrollment in the high school is 1,200 students.

School in which inquiry training was conducted

River Rouge High School

Pupils

Total number of pupils: 85

Number of pupils per group: 33 in one group, 32 in another group, and 15 in a third group

Selection of pupils: The first two groups were regularly scheduled classes. The third group was formed using the following criteria:

a. Students must be in grades 9-12.
b. Students must be in a study hall.
c. Students must be doing failing academic work. (D and E) in their classes.
d. No IQ requirements
e. No disciplinary problem children were refused.
f. These students were designated as potential drop-outs.

Description of pupils: One group was classified by the counseling department as an average ability eighth-grade group (grade level range 5-9) and a bright or above average ability group of eighth graders (grade level range 6-12).

Program

For the two eighth-grade groups, the program began in September, 1964 and continued until June, 1965. Classes were given two sessions of one hour duration each week until January, 1965. Thereafter, the number of sessions was increased to three times a week for the one hour period. Both groups inquired into the three sets of inquiry films, 12 physics, 12 economics, and 12 physiology. The average ability group deviated from this pattern. They were given physics, physiology, and then economics. This change was made because the nature of economics seemed too diffuse and too abstract for the group at the time, and it was felt that more practice in dealing with concrete problems would make the inquiry into economics easier. After the physics and the physiology, the class did considerably better in the economics.

In both eighth-grade classes the children inquired as a total group until it was felt that they had sufficient skills to carry more of the inquiry process on their own. Gradually, the physical organization of the class changed to facilitate inquiry for more children. The first change was a dividing of the class in half, letting one group inquire while the other group listened, gathered information, and built theories for later testing. After a given period, the other half of the class inquired while the first group listened and rechecked their theories. Still later, the class was divided into small groups of five. The groups then inquired into the problems. If the group had data gathering kinds of questions, they would send a representative to the teacher for answers. Near the end of the period the class was reassembled for an examination of their theories.

An examination was made continuously of the process of inquiry in both classes. An attempt was made to familiarize the students with the rhetoric of inquiry training and how knowledge is produced. Because the bright group was able to conceptualize better than the average group, it was possible to actually study the production of knowledge in depth. The distinctions between description, explanation, and theory were examined very carefully as well as the appropriateness and usefulness of questions asked in the inquiry sessions.

The mode of inquiry was also used in the teaching of the inference process to a large degree. After having practice in inquiry training, the children very quickly understood the inference process and saw how it is used to create new knowledge. The pupils also realized how inquiry can be conducted into subject matter other than physics, economics, and physiology. Examples of some of the lessons in the inference process are listed in the text.

The class of potential drop-outs was created at mid-year. This group met for one hour two days a week. Inquiry was conducted into 12 physics and 3 economics films. The full sequence of films could not be shown because the group disbanded near the end of the school year. While the group was meeting, however, time was spent on the Black Box and the nature of the inquiry process. Unfortunately, there is no concrete data with which to evaluate the impact of the inquiry training sessions on these students. A factor which turned out to be an inhibiting one was the fact that attendance in the inquiry sessions was voluntary for this group, and it seemed that for a multitude of reasons the size of the group shrank in numbers. It is felt that if the students were scheduled to this kind of a class, important changes would occur in their behavior. At this point, it is only conjecture.

Other uses of inquiry training in the curriculum

A selected group of potential school drop-outs of average ability and at ninth-grade to twelfth-grade levels were combined for an inquiry training program in late winter.

Demonstration activities during the 1964-1965 school year

Throughout the 1964-65 school year visitors were encouraged to visit the River Rouge demonstration center. Visitors generally heard about the center through my personal invitation and those of my friends. All visitors were briefed before each session so that they would be aware of what was going on and what to look for. Time was set aside following each demonstration for the answering of questions.

On the average there were at least two visitors per month. In March alone 14 student teachers from Wayne State University observed two sessions. Visitors included local classroom teachers, teachers from Canada, elementary science consultants from Wayne County, curriculum consultants from the Michigan Department of Public Instructions, administrators, and staff members from Wayne State University.

Two demonstrations were given away from the demonstration center. One demonstration was presented to 20 members of the Down River Science Group (Science teachers from a seven community area, junior and senior high school level). The demonstration began with an introduction to inquiry training--necessary conditions, rules, rhetoric, etc. Children were used in giving the demonstration. A question and answer period followed the demonstration.

At the invitation of the Euclid Central Junior High School in Euclid, Ohio, three demonstrations were given. Three different groups of students were used for the demonstration. Two physics and one economics films were shown to the groups. The demonstrations were given during school time. Teachers were provided released time to observe. In attendance were principals, assistant principals, department heads, and classroom teachers from the various junior and senior high schools in the Euclid district. Discussions were held before and after each session.

Evaluation of the program

The objectives of the inquiry training program at River Rouge High School were to create the climate for children to learn how to inquire into various subject matters and to give the children the inquiry skills and practice in using the skills. Efforts were also made to establish the conditions necessary for the children to reason consistent with their cognitive style as well as to become autonomous learners. Another objective was to show the children how knowledge is produced and to give them an opportunity to produce knowledge for themselves.

Instruments used to achieve inquiry consisted of the 36 inquiry training films (12 physics, 12 economics, 12 physiology).

Teacher-made problems were constructed in American history, geography, and philosophy. The following are samples of the kinds of problems posed:

1. What forces or conditions caused early explorers to discover America?

   Inquiry into political, economic, and social conditions in the Old World, wind, water currents, and weather.
2. Why did the Negro end up as a slave in America?

   Same mode of inquiry as 1.
3. How did the introduction of new methods of warfare alter the ways of fighting the Civil War, World Wars I and II?
4. In a period of "boom" times like now, why did Presidents Kennedy and Johnson work toward a tax cut?
5. How do you know what you know? (philosophy)

No instruments per se were developed to evaluate the inquiry training program. Instead, the teacher was continually evaluating the progress of the inquiry training, the progress of the individual children, and the level, sophistication, and power of theories built by the children. It should be noted here that the teacher did not pass judgment on any of the theories at any time. Subjective evaluations being reported here were made in terms of how well the students learned the inquiry process and were able to use it. In general, inquiry training was conducted for the sake of itself for this year.

In terms of teacher perceptions of what transpired during the year the following observations were made:

In the first place, the pupils seemed to enjoy the inquiry sessions and generally responded well. In terms of the amount of time the teacher talked in the sessions compared to the amount of student talking, as taken from the scripts of inquiry sessions, at random, the students are talking 78% of the time and the teacher, 13% of the time. The other 9% is taken up by silences, pauses, and normal classroom interruptions.

It is also felt that pupils learned the strategies of inquiry and different methods of attacking problems. That is to say that the students learned modes of inquiry appropriate to at least three subject matters.

When the form and content of questions asked by students are examined, one finds that questions are more precise and problems are approached in a more systematic manner after a year's training. The students have acquired the ability, it seems from observation, to eliminate factors having no relevance to the problem.

The teacher has also observed that once students have arrived at a satisfactory theory, they are able to not only defend it, but also apply it to other related problems and situations. In defending their theories students have sometimes argued with the teacher when they are strongly challenged.

Students have developed very positive attitudes toward their own ideas and theories. It is significant that when a student's theory is challenged or tested by his classmates, he does not feel that the attack is directed to him personally. The students seem to realize that it is the theory or idea that is being criticized, not the person. With this attitude prevailing, students feel secure enough to advance more and different kinds of theories.

It is also felt that many students having inquiry training this year have become autonomous learners. These children can attack a problem, build their theories, and test them, and not have to depend on the teacher for direction or approval of their theories. The teacher feels that these pupils are self-sufficient learners. They have the skills necessary to satisfactorily inquire into more complex problems in the areas of the physical sciences and economics at this stage.

It was also found that some children have cognitive styles that make it easier for them to inquire into one kind of subject matter as opposed to other discipline.

Future plans for inquiry training

Plans for the next year called for a continuation of inquiry training at River Rouge High School. Involved in the program were two eighth-grade unified classes (average and slow learners) and one eighth-grade science class. The same amount of time was to be spent in inquiry sessions next year as this year.

A systematic evaluation of the program was undertaken in terms of subject matter knowledge, amount of teacher-pupil talking, and mastery of inquiry skills, and student autonomy.

Instruments used were the PCE tests in physics, economics, and physiology, given pre and post. All inquiry sessions were to be taped so that analysis can be made of the other three areas under investigation.

Submitted by: Fredric Rivkin

MISSOURI

University City

Demonstration team

Olga McDaniel, teacher of sixth grade at University Forest Elementary School
Elizabeth Hausman, resource teacher, University City School District

School district

School District of University City
University City, Missouri

University City is a suburb of St. Louis, Missouri. Approximately 17,000 families live in the district. The total enrollment in the school system is approximately 8,300. More than 80% of the system's graduates go to college.

School in which inquiry training was conducted

University Forest Elementary School

Pupils

Total number of pupils: 50
Number of pupils per group: 25
Selection of pupils: Group 1: average to high academic achievers
Group 2: slow to average academic achievers
Description of pupils:

These children include all of the sixth grade at University Forest. The children are from an average socio-economic community.

Program

Schedule

Dates covered by entire program: September, 1964 to June, 1965

Number of meetings: Forty-five minute session, once per week

Description of program

Sessions included the physics, economics, and physiology films and ideabooks.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

Visitors included the principal, one reporter, and two members of the main office staff who were assigned to record sessions for the purpose of evaluation. Approximately twelve parents came by special invitation, six parents have dropped in individually, and four or five teachers have visited. A professor from St. Louis University visited classes. There has been some orientation with some of these visitors; in some instances there have been follow-up discussions.

Featured in the St. Louis Post Dispatch was an article, "Yes-No System of Education Tried at University City," which described the inquiry program at University Forest Elementary School, the summer institute, and inquiry training as advocated by Dr. Suchman.

In University City Schools, a publication of the Board of Education, there was a picture of a classroom situation, a discussion concerning the summer institute, and an announcement of the T.V. demonstration to be presented in connection with inquiry training.

University City School District also releases a publication, The Impact of New Ideas 63-64 which describes the goals, objectives, and actual programs adhered to by the school district. There is a paragraph explaining their inquiry training program.

Demonstration and/or speeches

A local TV broadcast included Dr. Suchman with a group of children. A project staff member gave an address to the PTA at University Forest; demonstrations with classes led by Miss McDaniel and Mrs. Hausman followed the question-and-answer period. Faculty meetings for orientation were held at University Forest, Hawthorne, and Greensfelder schools. Four classroom demonstrations were given at Jackson Park School.

Evaluation of the program

Objective evaluation

Results from several taped sessions in controlled groups at University Forest and at another school are not complete. These evaluations are to be made at the end of the academic year by the district psychologist.

Subjective evaluation

Both of the teachers involved find that the program provides the children an effective environment for experiences in logical thinking. The films and ideabooks are excellently done. The children look forward to the sessions with enthusiasm.

Future plans for inquiry training

Teacher training

Tentative plans included a four-day workshop in the fall for (1) all principals, (2) all staff personnel, and (3) selected teachers. The sessions, sponsored by the University City Schools with the aid of Comprehensive Project funds were to be held in an appropriate area in University City Schools. Most meetings were to be held with released time; substitute teachers being used when selected teachers are used for workshops.

Continuation of inquiry training program

The team continued to use inquiry training the following year with the sixth grade at University Forest School. Miss McDaniel and Mrs. Hausman were to teach about fifty sixth-grade children who were grouped in a manner similar to the initial year.

Submitted by: Olga McDaniel
Elizabeth Hausman

OHIO

Canton

Demonstration team

Richard R. Dowding, principal
David Bertsch, teacher

School district

The City School District
Canton, Ohio

The Canton school system has an enrollment of approximately 22,000 students. Souers is the only junior high school (grades seven, eight, and nine) in Canton, but four additional ones are on the drawing boards for completion in the next ten years.

School in which inquiry training was conducted

Loren E. Souers Junior High School

Pupils

Total number of pupils: 92

Number of pupils per group: Four classes of high ability children in grades seven and nine. There were 47 eighth graders and 45 seventh graders.

Selection of pupils: One of the requirements for placement in this class was a Stanford-Binet score of at least 125.

Description of pupils: Most of the students come from the "better end" of town.

Program

Schedule

Dates covered by entire program:

Number of meetings: The four inquiry training groups met once a week for a 45-minute period; the time is taken from their science allotment.

Description of the program: Mr. Bertsch used the three sets of inquiry training films and did not use the Black Box.

Demonstration activities during the 1964-1965 school year

Visits and/or publicity

One article appeared in the local Canton newspaper, "Class Spurs Mental Agility; Souers' Pupils Get Inquiry Training." Along with a photograph of a classroom, there was a brief description of the Inquiry Training Program in Canton, the summer institute which was attended by the team, and forthcoming demonstration and/or speech dates.

During the school year the training center was visited by parents, teachers, principals, and members of the Board of Education.

Demonstrations and/or speeches

A meeting was held with the parents of the students involved last October, and an inquiry training staff member was present. The team members also met with the other teachers of High Ability Students in grades four, five, and six in other Canton Schools; a film was shown and questions were answered. The Chamber of Commerce was invited to send a committee to see on of the economics films, and it was well received. Mr. Bertsch and Mr. Dowding appeared before the Board of Education in Canton on April 5 and explained the program and showed a film. On two occasions the team appeared before staff meetings in elementary buildings (K-8) and have done a demonstration with children from the school. In addition, a May 13 workshop for all elementary principals included demonstrations with two groups of children and a discussion of questions.

Evaluation of the program

Objective evaluation

The PCE test was given to the students as a pretest in physics. Results: In the seventh-grade the range was from 18-38 out of a possible 42. The eighth-grade range was from 12-38.

Subjective evaluation

Comments from visitors have been favorable, and the Science Supervisor for the school system has observed the program and feels it has great potential in this area.

Future plans for inquiry training

Because of demonstrations and speeches, there are several schools in Canton that have indicated a desire to get involved with this program. The May 13 half-day workshop served to further orient the elementary school principals.

Teacher training

A three-day workshop
Approximate dates: June 22, 23, 24, 1965
Schedule: All day for three days
Location: Beaver, Pennsylvania
Sponsor: Beaver, Pennsylvania School District
Source of funds or support: Beaver, Pennsylvania School District
Staff: Staff will consist of Richard Dowding, David Bertsch and a secretary
Program: Planned after basic pattern of the Illinois Studies in Inquiry Training summer institute at the University of Illinois

Special problems

David Bertsch was not teaching at Souers Junior High School the next year; therefore, a woman teacher was selected to work with inquiry training in his place. She was observing and working with Mr. Bertsch in order to familiarize herself with the philosophy of inquiry. Mr. Dowding continued to work with her.

Submitted by: Richard Dowding
David Bertsch

California Demonstration Centers

Although no formal federally-supported demonstration centers exist in California, this state has widely incorporated inquiry training programs in their schools. Those California educators who are associated with inquiry training programs were asked to submit reports concerning these activities, which follow.

Los Angeles County

The districts involved in inquiry training to some degree include all those in Los Angeles County, except Los Angeles Schools.

In 1964-65, four different six-week inquiry training series were conducted in which eight school districts of Los Angeles County were involved. One six-week series was held in the Lancaster school district, and one was held in Downey. The other two six-week series were held for several smaller districts of the county. The teachers who participated in the series used inquiry with their children during the series. Children from the lower through upper socio-economic levels were included, though not by design but rather because they were in the teachers' classrooms.

In 1965-66, work was in the area of follow-up with some of these teachers. In addition, several inquiry training presentations were given to several school-district administrative groups and three college classes. As a result of the former, there were requests to initiate three new inquiry training series next year. This time, however, the series will be extended to eight sessions. A fourth series is also in the planning stage. Incidentally, demonstrations were given where possible as a part of the inquiry presentation. Where it was impractical to use children, tape recordings of sessions were used. The main evaluation technique is in terms of calls for future inquiry training meetings in the various districts.

In addition to the series planned for next year, a requested "administrative presentation" of two meetings, one working with children, and one a discussion/presentation, were scheduled. Two demonstrations with children were held at the NSTA Regional Conference in Arizona in the fall.

Submitted by: Ben B. Strasser
Supervisor of Science K-8
Office of the Los Angeles
County Superintendent
of Schools

Riverside Unified School District

Title: Inquiry Training & Creative Teaching Project

Purpose: Through inquiry training method, the district is trying to develop as fully as possible the divergent thinking potential of students in the upper elementary grades. The main purpose of inquiry is to train students to think. It is aimed at helping students to be more independent, systematic, and empirical in their approach to problem solving.

Procedures in carrying out the project: This is an extension of the inquiry training project initiated in the fall of 1964. The scope of the program is more interested in mental processes than in what content is mastered. It is intended to be a four-year project.

Phase I (1964-65) began in the fall with ten teachers. The project was undertaken through the combined efforts of the Elementary Instruction and Research and Testing Departments. Louis Beck and Don Wamba shared the responsibility for planning and conducting the meetings. This in-service education program was to acquaint key teachers with current thinking and experimental programs and update their content backgrounds in selected areas of inquiry. During the spring semester, a statement of philosophy and objectives of inquiry training and creative teaching was developed.

A total of ten in-service meetings were scheduled for this year. The group was given released time to meet for these sessions, about once a month. Five schools and ten teachers were involved. The in-service meetings have included studying, planning, developing, and implementing experimental materials for promoting thinking skills in students. During some of the meetings, sixth-grade students were brought in for demonstration.

Approximately 300 students were exposed to an inquiry training program centered around the use of science and social studies materials. The amount of class time scheduled for inquiry was flexible. Most teachers averaged about three demonstrations a month. Through this project, recommendations were made regarding the elements that make up an inquiry curriculum: (1) its objectives or goals, (2) the selection and organization of content, (3) the selection and organization of learning experiences, and (4) the kinds of teaching strategies to be used.

Phase II (1965-66) was to be an extension of the first phase. At this stage of the project, the Inquiry Study Group had a few answers and many questions. Some of the questions of concern are: (1) How should inquiry techniques be included in the school program? (2) How

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do we recognize and nurture creativity? (3) What is the best way to relate learning to the development of children? (4) What new insights might we develop concerning the way students think? (5) What knowledge and skills do students in our society need to learn?

To help the group to attack these basic questions, the following references were used: J. Bruner, Process of Education; Bloom, Taxonomy of Educational Objectives, Handbook I, Cognitive Domain; Krathwohl, Taxonomy of Educational Objectives, Handbook II, Affective Domain.

An In-Service Education Proposal for 1965-66 was submitted for consideration (A Workshop for Developing Creative Approaches to Learning Through Inquiry and Discovery). The program was to be expanded to include 25 fifth and sixth-grade teachers. Fifteen meetings were scheduled for each semester, offering a total of four units for the year. The workshops were to be held at the Education Center, 7:00 p.m.-9:00 p.m. The proposed dates were: September 21 - January 11; January 18 - May 24.

It is hoped that the ten teachers participating in Phase I will be willing to exercise some leadership with other teachers so that the limited pilot program will eventually affect the total program in the schools.

Phase III (1966-67). In-service education programs were to be continued for all participating teachers. It was hoped that enrollment would double, with teachers from the original inquiry study group helping with the instruction.

Submitted by: Louis Beck
Supervisor of Elementary Education
Riverside Unified School District

San Jose School District, Marin County

Names of teachers: Charles Lavaroni, Assistant Superintendent, San Jose School District; Fred Newton, Principal, San Jose Intermediate School; Dick Melendy, sixth grade teacher, Loma Verde School; Larry Schwartz, fifth grade teacher, Loma Verde School; Mary Hiatt, seventh grade teacher, San Jose Intermediate School; Barbara Caruso, eighth grade teacher, San Jose Intermediate School; Bob Long, sixth grade teacher, Pacheco School; Gene Bryant, fifth grade teacher, Meadow Park School.

School district: San Jose School District, Marin County, California. The district consists of approximately 3,000 K-8 students. Approximately 30% of the students come from the military, as our district is responsible for the education of the youngsters whose parents are attached to the Hamilton Air Force Base. The other 70% of our students are boys and girls who come from homes whose parents on the most part are employed in the neighboring communities of San Rafael or San Francisco.

School: Inquiry was carried on in the San Jose Intermediate School, the Pacheco School, and the Meadow Park Elementary School.

Pupils: The number of students involved on a long term basis were approximately 180. There was no criteria for the selection of students, except those students who were enrolled in the classes of the above named teachers. These youngsters represent a cross section of the San Jose School District student community.

Program: The program covered approximately October-May of 1964-65 and the number of meetings per week approximated one per group. Generally speaking, the program followed those as outlined in the Illinois inquiry training manual and each group was involved with the physics, economics, and physiology films.

In each case, teachers also carried inquiry training into the total curriculum by means of the presentation of other kinds of discrepant events, i.e., one teacher presented a blackboard hieroglyphic story, and from there, got the youngsters to inquire into the content of the story, and from that developed a series of linguistic-centered lessons evolving with the understanding of "coding and uncoding" of any spoken language. Another teacher used slide films of a Ghost Town in California, and from that developed many probes into the economic structures evolving the growth and decline of one-product communities. Still another teacher used the discrepant event of "a fifth-grade youngster who was doing quite well in school and all of a sudden began to fail," and from this developed a series of discussions and research oriented lessons around the factors, "human relations."

Visits and demonstrations: Several visitors were involved in the demonstration sessions. These came from schools in Marin County and from the neighboring counties. Possibly the most exciting such demonstration was given at the San Jose Intermediate School for some 35 to 40 teachers and administrators from the Sacramento Valley. Four demonstrations for this group were presented and were video-taped for review in the Sacramento area. One demonstration speech was given for the San Jose School Board by Charles Lavaroni, Dick Melendy and Larry Schwartz. One demonstration was given by Charles Lavaroni in the Laguna Salada School District, and two demonstrations were given in the Monterrey area. In all, a total of approximately 15 official demonstrations were given in the San Jose School District for interested educators from the Bay Area, one demonstration for the local school board, one demonstration for the P.T.A., and about six demonstrations given out of the community for interested educators, including one at San Francisco State College. Including a demonstration by Fred Newton and Charles Lavaroni at the University of California at Davis in May, it is safe to say that approximately 450 California teachers and administrators directly saw and discussed inquiry training because of the efforts of the San Jose group.

Evaluation of the program: No official objective evaluation was made of the program at the San Jose School District. No instruments were developed, nor were the instruments used in the Illinois project used. Subjective evaluation, however, was gleaned from teachers, parents and administrators. From this subjective evaluation, the following points can be reported.

1. Inquiry training needs the full understanding of the teacher before it can be an effective part of the classroom program.
2. Inquiry training does open up the instructional program and make the student responsible for his learning.
3. Inquiry training needs to focus in on the "process" gathering and synthesizing data, or it has a tendency to lose its effectiveness and acceptance on the part of the students.
4. Schools that are willing to take on inquiry training as part of the total program must be prepared to provide a variety of materials and human resources for the students.
5. Generally speaking, parents support inquiry training and in turn become more supportive of a less textbook-oriented program.

Teacher training: It was the full intent of the Navato Unified School District (of which San Jose became a part as of July 1, 1965) to continue its efforts in inquiry training. One new school was staffed by four of the teachers who had taken an active part in the program up until that time. It was the intent of this staff to meet every two weeks to review their progress, and to identify some of the process tasks which are most appropriate for the specific grade levels, five and six. These people were also to serve as a nucleus for the training of other teachers in the 11 elementary schools encompassing the K-6 program of the Navato Unified School District throughout the full year of 1965-66.

During the summer of 1965, Fred Newton, principal of the San Jose Intermediate School, conducted a three week workshop for inquiry training at the San Francisco State College during their regular post session. This workshop closely paralleled the workshop conducted by Dr. J. Richard Suchman in the summer of 1964. Teachers from the Navato Unified School District attended this workshop, and they too serve as nucleus people to work with those who developed their competencies during the 1964-65 school year.

It was also intended that a small grant be submitted for the Navato Unified School District, through the cooperation of San Francisco State College, in order to test the feasibility and useability of the 8 mm cartridge films with the 8 mm Fairchild sound projector. The person working with us in developing this project is Dr. Dan Peck of San Francisco State College.

Several people from the San Jose School District (Navato Unified School District) worked with interested administrators and teachers from the Sacramento Valley area for their efforts in developing a cadre of leaders in inquiry training for 1965-66. Mr. Art Costa of the Sacramento County Superintendent of Schools Office headed that project and received help from the California State Department of Education through N.D.E.A. Title IIIB funds.

Problems in inquiry training: As seen by this group, problems consist of those which center around the bringing of the underlying theory of inquiry to the total classroom program for more and more teachers. This problem is a fascinating one, and one that is beginning to see progress as evidenced by the use of the elementary school libraries. In those schools where teachers have used inquiry training as a philosophical base for organizing learning, we see an interesting increased use of the library on the part of the students. We also see the library being used differently, where several resources are being checked out by students.

At first, the problem for inquiry seemed to be focusing in on the kinds and quantities of materials. However, as this year has gone by, we now see that the problem is focusing instead on the kinds and quantity of in-service experiences we are providing for the teachers. Interestingly enough, teachers do find the time for discussion, demonstration, and critiquing of inquiry activities. Interestingly enough, inquiry has begun to serve as a theme for classroom planning.

It seems important, from the group who have been working in our area, that somehow they keepinformed of the activities of other people throughout the state and the nation in inquiry. We have, on one occasion this year, met with the people of the East Bay, Contra Costa County, and Alameda County. However, with the terribly busy schedules all of us are facing, a newsletter of some sort is tremendously important.

Submitted by: Charles Lavaroni

CHAPTER IV

CONCLUSIONS

The inquiry training teams were able to fulfill the objectives of the project by stimulating interest within the various school district and by gaining experience in conducting inquiry sessions. As demonstration centers, the teams have aroused a great deal of public approval; parents and other educators are requesting the continuation and expansion of inquiry programs in their schools. The impact of the program on the curricula of the districts is considerable, since most districts have continued to use inquiry training in their schools and many are reshaping their programs as well. At the beginning of the demonstration program, 523 children, 14 teachers and 7 principals were directly involved in it. Although the figures are not available, many others became involved later during the school year and in subsequent school years. Student enthusiasm has been marked, accompanied by growth in inquiry skills and increased autonomy.

The numbers of visitors, demonstrations, lectures, conferences, and materials disseminated as presented in Chapter III provide some indication of the considerable interest that was generated by the centers. In spite of limitations of time, funds, and professional assistance, most of the centers have been able to fulfill requests for workshops for other educators. Workshops were also held in various areas of the country such as Oregon, Ohio, and California.

Setting aside the first school year for practice was essential in this situation. The workshop could provide only an introduction, although might have been able to produce somewhat deeper involvement.

That first year also stimulated experimentation with new techniques and materials; this creativity ordinarily does not occur on a regular basis in the classroom, and is an important state of mind to promote in order to encourage teacher growth. The teams appeared to profit from visits and comments from the staff, particularly when visitors critiqued the teacher's inquiry class sessions. The visits also provided gentle reminders, review, additional explanation and moral support. The teacher may be well versed in inquiry, but assuming the new teaching role which is required presents a difficult adjustment. The new role requires the alteration of strong habit patterns and the development of an inquiry style of teaching that is compatible with the program and with the teacher's personality. Periodic visits, the handbook, protocols, newsletters, and tape recordings of team sessions all served to supplement more immediate assistance. It was valuable for team members to critique each other, too. To facilitate the acquisition of the new teaching roles, more frequent visits would have been desirable. A brief midyear workshop for team members might have provided worthwhile review and discussion at a critical point. It remains to be seen whether the public and professional interest generated by the teams will continue, and whether the program will be broadened, taken on by new schools and teachers, or will be lost to view. It is interesting to note the rapid acceptance of a new program in the curricula when the demonstration team approach is used; perhaps the introduction of change by teachers, rather than being imposed by administrators, is important. The process of disseminating educational innovations by means of demonstration teams seems to be a fairly effective, more immediate means of introducing new ideas to the schools; too often these ideas remain vital only in research centers, or become mislaid in professional journals.

The following remarks are relevant to the consideration of the utility of the demonstration team approach in disseminating new educational curricula and techniques. The process of dissemination entails a more complex effort than the physical effects of a workshop, practice, and demonstration. The workshop must be reexamined and carefully planned in view of what can result from it through an entire school year; the school year must consist of suitable conditions in which to permit changes or improvements to take place. The process of true educational change is so gradual and difficult to bring about, that the complexity of the factors contributing to the changes must be recognized and considered as thoroughly as possible.

The individuality of each team and team member was remarkably prominent as their inquiry training programs developed. Although much of the physical arrangements and materials was similar, each team situation took on an individuality that appears to be dependent on a number of factors. One prominent factor in the interpretation and application of inquiry is the personality of the teacher. Some teacher characteristics which appear to influence the procedures and outcome of inquiry training are as follows:

1. The teacher must be flexible, willing to experiment and to make mistakes. Each inquiry situation differs from any other inquiry situation to such an extent that it must be reacted to as it takes place, and cannot be entirely predictable or planned. Although the most successful outcomes arise when the teacher is able to capitalize on the "teachable moment," certain demonstration team members found it extremely difficult to change the course of inquiry midstream. It is also necessary for the teacher to be able to recognize the

possible variations and applications of inquiry training methods and theories. A great deal of interrelating of curriculum areas and a variety of learning experiences are possible through inquiry; the examples provided in the manual and through the workshops are only introductory, since so much more can be done.

2. The teacher must be objective in terms of the teaching-learning situation as well as with regard to personal self-criticism. Frequently a team member would have great difficulty in recognizing a deviation from acceptable inquiry practices until this was called to his attention. At nearly every moment of an inquiry session, the teacher must be continually aware of the significance of his role in guiding the inquiry process. Of course, the teacher cannot be so self-conscious as to inhibit his usefulness--he must have sufficient self-confidence not to fear errors and must recognize that errors are a part of his growth.
3. In conducting inquiry sessions, the teacher must be willing and able to turn over the direction of the process to the learner. He cannot be threatened by his loss of authority. It seemed to be difficult for some teachers to recognize when to relin uish more of the authority of the inquiry process to the child; this factor often produced a stalemate in the inquiry program, since the children were blocked from seizing their authority.
4. The experiences of the teacher contribute largely to his ability to step into the new role as an inquiry guide. The amount of in-service, current information which the teacher

has is relevant, although knowledge about innovation does not ensure that the individual is capable of innovation himself. It is not unusual to note that brand-new teachers seem to adapt quite readily and thoroughly to the role of conducting inquiry; experience can hamper true growth, particularly if the teacher is of a firmly didactic discipline. The teacher of inquiry must be at least sympathetic to inquiry if not a true inquirer himself.

5. Awareness of the cognitive needs of individual children took some time to develop in certain team teachers. It was surprisingly obvious that these teachers were not in the habit of observing and analyzing the children individually. This ability requires a development of sensitivity to cognitive needs which a few of the teachers could not quite appreciate the need for at all.
6. Understanding of the subject matter allows the teacher to be flexible, introspective and more aware of the significant aspects of the inquiry situation. Teachers who were weak in the subject matter were hampered by the additional encumbrance of keeping the "facts" in mind too. It is a distinct advantage to be well-versed in the subject matter used in inquiry for this reason, although some knowledgeable teachers must then struggle to not overemphasize subject matter at the expense of inquiry skills.

The demonstration team experience provides teachers with an opportunity to determine for themselves whether or not they are capable of guiding inquiry, and to what extent. This experience provides an excellent, if not exceptional climate which permits teachers to analyze the teaching situation and to grow more confident in manipulating learning experiences. By adapting to the inquiry role, the teacher must, of necessity, recognize the critical relationships among learning objectives, teaching procedures, and actual learning outcomes. With these specific demonstration teams, the full school year was a necessary minimum of experience for them, since complex educational changes were received both personally and externally.

A second factor influencing the characteristics of inquiry training as conducted by each demonstration team was the underlying philosophy of the school system. The attitudes of the administration toward the installation of inquiry training classes had considerable effect on the outcomes. In situations where the administration was congenial to the new program, teachers who began weakly were able to grow and create desirable outcomes because they were not limited by external pressures. In other settings, superficially congenial school systems would produce a program that outwardly resembled inquiry training, but which lacked the incredible curiosity and excitement which characterizes independent inquiry. At times, the administration served as a threat to the teacher only because of a breakdown in communication, which needed to be recognized and remedied.

A third factor contributing to the fulfillment of inquiry training demonstration teams was the discrepancy between understanding the inquiry procedures and actually producing inquiry situations in the classroom. Inquiry training does not require the teachers to model themselves after the demonstrators of inquiry, nor after any particularly static model; however, it does require that the techniques which are employed are consistent with the theory and objectives of inquiry. Some degree of consistency is essential to being able to create the essential learning objectives at each level of competency in autonomous inquiry. The extent to which the teacher became directly involved in the proceedings of the workshop and in actually assuming a new role as the guide to inquiry skills seemed to influence the resemblance of the outcome in a demonstration setting to the outcomes which are the objectives of inquiry training. Certainly a new program such as this can be altered if the alterations are strongly justified by the needs of the children; however, such changes must be regarded with caution when they run counter to the objectives of the program. Involvement in and assimilation of inquiry also determined the quality of communication between team members; lack of involvement as well as personal differences were able to hamper the richness of a demonstration team's experiences.

The value of the project to the gifted children involved was neither objectively nor carefully tested due to the flexibility permitted for each school program. The accumulation of personal reactions seem to indicate that an approach such as inquiry training does lend itself to the education of the gifted since it frees individual cognitive styles while offering guidance when necessary. Hopefully, too, inquiry training enriches independent study skills for a child who is capable of going beyond the limitations of his teachers and curriculum. Some teams adapted inquiry training approaches to the culturally deprived and to the educable mentally handicapped, whereas others were of the opinion that the program is suitable only for the above average in intelligence. Since the demand for inquiry training continues, perhaps further more careful experimentation directly in the classroom may someday provide additional insights.

References

Suchman, J. Richard, The Elementary School Training Program in Scientific Inquiry. Title VII Project Number 216. Urbana: University of Illinois, 1962.

Suchman, J. Richard, & Carlson, Sybil B., Science Concept Development in the Elementary School Through Inquiry Training. Cooperative Research Project No. 1547. Urbana: University of Illinois, in preparation.

APPENDICES

A. Teacher's Manual

B. Demonstration Film Scripts

C. Newsletters

APPENDIX A

Teacher's Manual

APPENDIX B

Demonstration Film Scripts

APPENDIX B

DEMONSTRATION FILM SCRIPTS

FILM I: LEARNING TO INQUIRE

NARR: Inquiry Students apply their ideas to solving problems.

STUDENT: He said that because of the heat that the molecules expanded, or got to moving faster. But why? I think it is somewhat like at a railroad station. At least this is the way it was explained to me. There are a lot of people standing on a platform. All of a sudden one of the cars next to the platform catches fire. Now the people run to get away from the fire or the heat. Now the molecules just sort of don't like heat, so they run away from it also.

MUSIC

BABY SHOT

SUPER TITLE: LEARNING TO INQUIRE

SHOT OF PROBLEM FILM #5: "Balloon and Vacuum"

SUPPER TITLE: Physics, Problem #5

STUDENT: Well, first there is a balloon inside of a bell jar, doesn't have any leaks or any way for the air to get out except for the hose. None is getting out at the moment and then she turns a valve so that air can excape through the hose. Then she turns on a vacuum pump that makes the air escape, while it is going out, less and less air molecules are in the bell jar, so that the air molecules that are there didn't have as much pressure on the balloon so that the balloon can get larger because it had the same amount of air pressure it had at the beginning. Then when she--and then when it gets so big, she starts to put the air back into it and the balloon get back to its normal size because more air molecules get into the bell jar and have more pressure on the balloon so that it gets smaller.

NARR: Ideas give rise to questions. Questions are used to gather information needed to test and strengthen theories. Theories and explanations that grow out of the children's own questions are more meaningful than a preformed conclusion from an outside source.

STUDENT: Was the machine's job to exhaust air from the bell jar?

TEACHER: Yes, the machine's job did pull out air out of the bell jar. Carolyn.

STUDENT: Was there water or air or anything or it was just air in the bell jar? The balloon...

TEACHER: Yes, no water. Carla.

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STUDENT: Was the bell jar air tight?

TEACHER: Yes, now I should say it could be. Maybe I should go back and say to you, when and what did you mean by air tight.

STUDENT: I mean does it have any leaks in it?

TEACHER: You mean uncontrollable leaks?

STUDENT: Well, I mean controllable leaks.

TEACHER: Yes, it has controllable leaks. Carolyn.

STUDENT: Was the little thing she turned at the end, was that to keep... Was that opening up something to let air go back into the bell jar?

TEACHER: Yes, had something to do with letting air back into the bell jar. Wendy.

STUDENT: Let's see. Was there only uncontrollable leaks...like under the jar...the bell jar as it went down?

TEACHER: No. No uncontrollable leaks.

STUDENT: Oh, OK, I pass.

TEACHER: Alexander.

STUDENT: Was air or gas in the balloon compressed beyond...uh...beyond normal?

TEACHER: Yes. Carolyn.

STUDENT: What was in the balloon? I mean, what gas?

TEACHER: You want to ask a yes or no question?

STUDENT: OK...Was helium in the balloon?

TEACHER: No.

STUDENT: Was there air in it?

TEACHER: Yes...OK Carolyn.

STUDENT: Did the lady blow up the balloon and put it inside the bell jar, and put a cover down on it and then she turned the machine on?

TEACHER: Well, yes. The balloon was blown up and it was put in the bell jar and the machine was turned on. All these things did happen. Yes.

STUDENT: Well, did the lady blow it up?

TEACHER: Herself?

STUDENT: Yes.

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TEACHER: We'll say she did. I may have blown it up, I don't know if she did exactly. Wendy.

STUDENT: How much was the balloon blown up to?

TEACHER: Well, give me an idea.

STUDENT: Was it blown up fully?

TEACHER: No. You mean in the beginning?

STUDENT: Yes. When it was raised up, was it blown up ½ way?

TEACHER: Less.

STUDENT: 1/3.

TEACHER: Maybe...Yeh.

STUDENT: Well, when the air was forced inside could it...perhaps have passed through the small holes in the rubber from inside to make it expand?

TEACHER: No. Carolyn.

STUDENT: Could I try and explain?

SHOT OF PROBLEM FILM #9: "U Tube Monometer"

NARR: The students learn that their theories are a means to an end, the expansion of their own knowledge. Every theory is subject to a test, in order to find the most meaningful explanation for observed phenomena.

STUDENT: When the lady sticks the glass tubing into the water, the water flows up the tubing to about 2 inches above the top of the water. Then the air in the tube from the top of the water to the red liquid gets pushed because of the air not having all the space it used to... so it pushes the red liquid upward in order to have enough space for itself.

TEACHER: Let me ask you some questions about your theory. Why doesn't the liquid just keep going? At what point does the liquid start moving up?

STUDENT: When air has same amount of room as it did before.

TEACHER: In other words air is occupying the same amount of space in the beginning as in the end. No...is not true.

STUDENT: Sure, it spread out, becomes thinner and the red liquid could seep in between it.

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NARR: One test of theory is the power it gives one to predict. The children learn to think critically about theories.

STUDENT: Could you do this experiment on the moon?

TEACHER: No, not this way. It has a difference to get there. Next to impossible.

STUDENT: If air there on the moon, just like Earth it would be possible wouldn't it?

TEACHER: Now talking about a different situation. Even if you had atmospheric pressures. Carla.

STUDENT: On the moon now water would fly up. **TEACHER:** Morry

STUDENT: Would it be any difference if she could do it on the moon and then on a bigger planet...like Jupiter?

TEACHER: Yes, it would make a difference. Amy.

STUDENT: Would it be harder on Jupiter than it would be on the moon...

TEACHER: No...to do this? It would be a different result in Jupiter too. But I don't think it'd be any harder there than on the moon.

STUDENT:: Any easier?

TEACHER: Hard to say, it would be different kinds of problems.

STUDENT: If it would be some sort of artificial gravity on the moon and the air pressure was equal to the Earth's...would you have the same results?

TEACHER: No. etc. It would have the same conditions, you could do it. Wendy.

STUDENT: I would like to try and explain.

NARR: The second major test of a theory is its applicability to other problems.

STUDENT: While we're thinking about this problem, can we think about other ones?

TEACHER: Sure, by all means.

STUDENT: Well, really, I think that this is about like some of the films we have seen that the balloon gets smaller again. But the balloon cannot just get smaller again, but has to do something. It's got to find a different way because it doesn't have a fixible covering, and so it just has to collapse insteadd

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TEACHER: So, Gee...we have found some specific things about these ideas. The specific thing. What about this statement? Is this used in more than one problem? Some of these statements will help you find ideas and understand 3, 4, 5, and 1,000 problems instead of one.

NARR: The developing child acquires a wealth of first hand knowledge about his environment. Later on, he draws upon this as he learns to build theories.

STUDENT: Well, it is sort of like a balance. If there isn't enough... well...say you are on a tetter-totter and you have a little ...a baby...well strapped suppose into a chair in there--on there...and you got down on it and the baby would go up and if you just sat there, the baby wouldn't go down again, because you got more weight on your end than the baby has on his.

STUDENT: Well, is it like when you have a can full of fruit juice and you want to let it out, you have to punch two holes instead of one?

STUDENT: Now, the people run to get away from the fire or the heat. Now, the molecules just sort of don't like heat, so they run away from it also.

NARR: A different kind of learning experience is to become aware of the process and operations of inquiry. This provides a means to improve explanations and information gathering questions.

TITLE: Carla and Morry describe their strategies for solving the problem of what was inside the black box.

STUDENT: First we tried to see what would happen when we did certain things. And then we started probing. I kept running into something here, but I thought there couldn't be anything there and I probably hit something on the side of the box. And right here is where it gave us the trouble. When we probed in here, we thought for a moment that it was a tinker-toy. But I thought that I would probe around it sort of and see what shape it is. I felt the yellow stick here and I thought--Good grief--it must be the pulley with a shape like this...so long and stiff. It couldn't be the tinker-toy.

STUDENT: Well, we first just poked around to see where certain things were. we did a lot of things first. But then we pulled this string and we knew something we pulling on this. There was some opposition that kept this from just... You could see...we could see... we could only move this stick from side and not up and back. And I noticed that when you pulled the stick over this way that the stick went out that way. And so...I from before...since you could only go that way I thought this stick had to be hooked up to a tinker-toy; or something that would revolve around a peg and that would hold sticks too.

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TEACHER: OK. Now once again. You saw this behave a certain way and into your mind came the idea...Ah ha!...Tinker toy...What was it that made the idea tinker toy come into your mind when it behaved this way?

STUDENT: Well, the properties of the ...

TEACHER: You knew the properties of the tinker-toy. OK. And so you looked through here actually and said, "What things will have the properties of being able to behave this way, that is having something shift and kind of moving in an arc and you thought this is the only wheel that would enable the stick to fit in. So it fit the picture pretty well. Now once you thought there was a tinker-toy there, how could you check to see if your hunch was right? Now this suggested tinker-toy. How could you be sure it was a tinker-toy?

STUDENT: I wasn't really sure.

TEACHER: How could you have been sure? Betty had a strategy for finding things she wasn't sure of. How would you have found out?

STUDENT: Of course you could use the process of elimination also again.

TEACHER: Yes, you could. Supposing you didn't want to. You just want to find if there was a tinker-toy there? What would you do, Betty.

STUDENT: I'd just poke around.

TEACHER: You would poke around. How would you do it? Exactly how would you do this?

STUDENT: Well, I'd use the poker and try things from different holes until I hit it.

TEACHER: OK. Suppose you wanted to find out exactly where something was underneath and you only had two pokes to do it in. How would you go about it?

STUDENT: I'd poke in the middle and here.

TEACHER: How would you know exactly where it was if you had the cover on? Uh, Morry?

STUDENT: Well, I think if this is the poker stick, and you hit something over here and you mark that down on your sheet; and you hit something over here from a different angle, but still in the middle of the thing. Then you know there is going to be something there.

TEACHER: I see. You're watching the distance and the angle, and where these two meet would be where the thing is. That sounds like pretty good strategy...(FO)..How did you people operate? What was your strategy?

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NARR: Inquiry students learn to analyze both structure and function to make predictions.

STUDENT: I agree with all of them except that they didn't say anything about its springing back. I think if you push this down towards the table, here, it would have a springy effect and spring back.

TEACHER: If you push with this...what...

STUDENT: Towards this direction.

TEACHER: This?

STUDENT: No, the other stick.

TEACHER: This?

STUDENT: Yes.

TEACHER: If you push this towards the table, you would get a what?

STUDENT: A springy effect.

TEACHER: A springy effect...that's a function...isn't it?

STUDENT: Yes.

TEACHER: OK. Lets try these different things and see. First we'll pull this string outward by itself... Were the predictions borne out?

STUDENTS: Yes.

TEACHER: All right. Now let's try pulling this one without holding this... Well, that prediction was correct. You didn't get any action there. Now suppose we did the same thing but held this steady like that. What's the prediction here?

STUDENT: Should do the very same thing.

STUDENT: Well, I kind of would like to add something. When... I think... if you don't always holding the string on this side...I think that the big white stick that goes in the tinker-toy would hop right back because of that spring there. And then the string would go back again to about the same length.

TEACHER: How did you know that that was a spring?

STUDENT: Because it looked like it.

TEACHER: All right. So what were you using...function or structure... to tell you that it was a spring?

STUDENT: Structure.

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TEACHER: Ya. If we had the lid on and you moved this thing over, and it snapped back and you said there was a spring in there. What would you be using then? That is to say that it was a spring? Carolyn.

STUDENT: Function.

TITLE: Students learn that the statement of properties gives an explanation power.

STUDENT: All matter takes up space. Can be compressed, but still takes up some space. Can't get around it.

TEACHER: Alright. (Write on board) That would be something we would feed into this explanation...this idea bout matter taking space.

STUDENT: I thought of another fact that would be...that would go to... uh...and might add has weight too. And if it has weight, it has to have pressure.

(WRITE ON BOARD)

STUDENT: If the air in the tube...and the air in the room were under compression, would the water rise the same?

TEACHER: If the air in the room were...were under compression would it rise the same? No, there would be a difference. Alex, do you pass?

STUDENT: Yes.

TEACHER: I think we're making real headway now toward an explanation, not just a description.

TITLE: Students also learn that the statement of necessary conditions makes an explanation explicit.

STUDENT: Then when she...and then when it gets so big, she starts to put the air back into it and the balloon gets back to its normal size because more air molecules get into the bell jar and has more pressure on the balloon so that it gets smaller.

TEACHER: OK. Would anybody like to translate that into another form by stating what would be the necessary conditions for the balloon to get larger. OK. Carolyn.

STUDENT: Well, the necessary conditions would be for it to get larger... would be that the pressure inside the balloon would have to be greater than the pressure outside the balloon.

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MUSIC

NARR: Infants explore their environment by scanning and manipulating. These search patterns are carried over into the more sophisticated inquiries of the older child.

TEACHER: Do you see any other choices that might help us along the lines that we've discussed? Morry.

STUDENT: Number 10

TEACHER: Number 10. Oh, how do you see that as helping? Of course in the first problem it's no...it doesn't help us, but after the first one how do you see it help...

STUDENT: Well, if you uh...have a...problem that's similiar to the...to the one you're talking about, you can go back and see what makes that tick...that a...problem tick. And then you apply that basis to the problem you're working on.

TITLE: The teacher does best to capitalize on children's own experiences and intuitive notions to allow for the greatest possible growth in autonomous learning.

TEACHER: Um, presense of some unusual thing...that would be a condition wouldn't it? If there were a live alligator running around on the floor, you would have a better idea because knowing the properties of the classroom, you know that a live alligator running around on the floor in an ordinary classroom would produce some kind of noise.

MUSIC

END OF PART I, Learning to Inquire

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FILM II: CREATING THE CONDITIONS FOR INQUIRY

MUSIC

BABY SHOT

SUPER TITLE: CREATING THE CONDITIONS FOR INQUIRY

NARR: Besides the knowledge and intuitive notions of strategy that children bring to inquiry, each child has an operating style of his own, a factor of particular importance in fostering autonomous learning.

TITLE: John has difficulty expressing himself, but the teacher and students help him by waiting as he performs important verbal experiments.

STUDENT: Supposing that the liquid in the tank was mercury and pressed down, would it lower the glass tube into the tank? Would the red liquid have gone further up the tube?

TEACHER: Yes, if you have used mercury. Give you some notions about ideas, I hope.

STUDENT: If you put the tube down in the tank of mercury, the air in the rubber tube would have pressed on the red liquid may have gone higher? I pass.

TITLE: Wendy is an uninhibited inquirer, and often comes up with interesting ideas for the rest of the class.

STUDENT: As deeper as you pushed the glass tube and the rubber tube down into the tank, would the red liquid spurt out of the tube?

TEACHER: Yes, if you have pushed it down far enough. Yes.

STUDENT: If you do something opposite, like a tank of air and water in the tube, would the same thing result?

TEACHER: No.

TITLE: Sherwin has more previous knowledge of physics than the rest of the class, and often talks above the others' heads. Room must be made for such children to operate at their own level without letting this discourage or interfere with the inquiries of the other children.

STUDENT: No, I want to go on. Water farther down to surface because of weight of water displaces in the U-tube minus the compression and then when you add those up ...

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TEACHER: Do you all understand what Sherwin is saying?

STUDENTS: (Giggle)

STUDENT: They get how far from the top.

TEACHER: If you don't understand what Sherwin is saying, you can ask him questions... Yes or no questions. I think I understand what you are saying. Keep that explanation in mind as we go along and people would see if we can accept it or reject it. They will. Amy.

STUDENT: Could Sherwin say it over again in a couple of sentences. I couldn't follow him.

TEACHER: Too much all at once ... yeh. Look. I think...I think maybe it best for us to come to understand these things for ourselves. In other words, instead of trying to digest everything Sherwin says... he understands it. Sometimes it is hard to say what you understand to somebody else so they can understand it even though you understand it yourselves. Maybe the best thing for you to do is to see if you can come to some kind of understanding by your own questions... either by looking at the Ideabook and gathering more information and seeing if you can piece it together for yourself. Uh. We're still open for questions.

TITLE & PROBLEM FILM: CONCRETE PROBLEMS PROVIDE A FOCUS FOR INQUIRY

SHOT FROM PROBLEM FILM "VARNISH CAN"

NARR: Problems serve to attract attention and give direction to inquiry. An event that surprises and puzzles the child prompts inquiry almost at once.

NARR: Sometimes focus problems are made up for specific inquiry lessons.

TEACHER: This is a story about a principal in a school. And he's walking down the corridor of the school and he hears a great deal of noise coming from Mrs. Jone's room. Now, what I'd like you to do is to give me some kind of an explanation for this.

TEACHER: Now supposing we are on a strange planet and we know nothing about the properties of matter on this planet. It is all new to us and there is no guarantee that this planet has any relationship to earth. It is in a different universe. All right. We don't know any properties. We'are coming there completely ignorant. We see some things happen. We have a stake that is stuck into the ground. Attached to this stake is a balloon. The balloon has a long, long cord on it. And we let go of the balloon and it rises. As it rises it gets smaller, and it rises until all of the cord is used up and then it stops. And it stops up there way at the top. Inside the balloon is water. What you have to do is to ask me questions to give me a reasonable explantion of why those things are happening. OK. You can figure it out. We go right around. Carolyn.

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TITLE: In time children may provide their own focus, by discovering new problems or discrepancies.

TEACHER: Now here...do you understand every link in the series of events between the pushing and the changing of size? Does it all fit together? And maybe it does at a particular point, but maybe after you've gathered more facts it wouldn't...because you didn't...you thought it was one thing and it was really something else. Yes, Sherwin.

STUDENT: Well, it already doesn't. Todd doesn't think that the balloon gets any more pressure in it and I do and it doesn't...

TEACHER: All right.

STUDENT: ...know who's right.

STUDENT: But if you make the ring expand in all directions, then it would also expand in and the ball wouldn't get through.

TEACHER: Let's hold that. That's a very interesting point. Let's hold that there for a minute. I want to get back to it.

STUDENT: Well, what about that? Would it expand in all directions?

TITLE: Freedom is a necessary Condition for Inquiry

NARR: There is no right way to inquiry. Whatever contributions a child can make are reinforced.

STUDENT: Would it make any difference if the red liquid was something else?

TEACHER: Yes, it could have. That's an experiment and a nice one, too.

TITLE: At the same time, a wider range of possiblie means of attach is made available to each child. Here, in the last session, John offers an explanation for the first time.

STUDENT: I would like to try and explain.

TEACHER: All right.

STUDENT:* Now, you said that the ball went through the ring freely at first. They took the ball and they heated it and the heat caused the molecules in the ball to expand. So the ball got slightly larger. Then when they put it in the ring again it didn't go through, because it was larger and the ring was not. But when it sat there for about 25 seconds, this gave it time to cool off and to contract again making it small enough to go through the ring and it fell through.

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*Student is explaining "Ball and Ring" Expirement.

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NARR: Freedom means less concern with being right, more willingness to try out ideas and to be critical of themselves and others.

TEACHER: Let me pass out to you for a second some explanations of this film. Look at them very quickly and see what you think about them. No, no, these are not answers. There are three sets of explanations and I would like to know what you think about them and how you would prove each one. Let's look at the first, No. 1. Now there is an...or in there air pressure made the can collapse or suction made the can collapse. How do you feel about those explanations? Sylvia.

STUDENT: They don't tell you very much.

TEACHER: They don't tell you very much. What would you like to know besides that? You know, what's missing? Just... OK. Now, Todd.

STUDENT: It doesn't go enough into detail to tell you anything. Like if you were telling someone who hadn't seen the film and you told them what happened...air pressure made the can collapse...well, they could just think that you put a can outside on a back stoop and the air made it collapse. You would have to tell them that you heated it, put water in it. It doesn't go enough into detail.

STUDENT: Well, I disagree with Carla that if the...if the peg and the tinker-toy has anything to do with it...going down and up.

TEACHER: You think that this is unnecessary.

STUDENT: No, I do think it is necessary.

TEACHER: You do think that it is necessary. If we took this peg out, you do not think it will behave in the same way?

STUDENTS: No.

TEACHER: We could try that out too. We could experiment and find out which of these structural properties of this things is actually necessary. We could remove any part and see whether it would behave differently. Yes, Carla.

STUDENT: I think I agree with Morry now.

TITLE WITH MUSIC: Responsive Environment - The Third Condition for Inquiry

NARR: The infant learns about his environment by watching the way it responds to his actions. The teacher can make the classroom environment responsive by answering the children's probes for information

STUDENT: How thick was the can approximately?

TEACHER: Oh, my.

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STUDENT: 1/8 of an inch?

TEACHER: Oh, no.

STUDENT: 1/16 of an inch?

TEACHER: You mean how thick was the metal?

STUDENT: Yes.

TEACHER: No, it was not even 1/16 of an inch, I don't think.

STUDENT: Was it quite thin?

TEACHER: Yes.

STUDENT: About the regular thickness?

TEACHER: Yes.

STUDENT: OK, I pass.

TEACHER: Sylvia.

STUDENT: Oh, uh, oh, yes, did she have the can on the flame for a long time, like about an hour or...

TEACHER: No.

STUDENT: About 15 minutes.

TEACHER: No, not even that.

STUDENT: 10 minutes.

TEACHER: A little less.

STUDENT: I pass.

TEACHER: All right, Morry.

STUDENT: If she hadn't put the cork on, and she pured the cold water all over the can, would the can still have bent all up?

TEACHER: If she hadn't put the cork on, the answer is no. Sherwin.

STUDENT: If she would have kept the cork on while she was boiling it, well... thinking that the can won't blow up and the cork won't blow out... would it have done anything when you poured the water on it?

TEACHER: No.

STUDENT: I didn't think so...can I try to explain?

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TITLE: Becoming Aware of Operations

NARR: Children become aware of the inquiry process first by performing operations naturally, then discussing what they have done.

TEACHER: Well, what was the specific question - do you remember?

STUDENT: I asked what it was that was on top.

TEACHER: Yes, now, how would you characterize the question? "Was that rubber on top?" What was the question doing? What was the job it was performing? Todd?

STUDENT: Asking what?

TEACHER: What something was. You were trying to find out about an object, right ? Let's keep track of the kind of questions that you might be able to ask. Then we have questions about objects. Why don't you begin now thinking of questions you might ask about this and we'll see what kinds of questions they are. So far, we've got one about an object. Is there something else you might want to find out about this in order to get a better explanation? Alexander.

STUDENT: Were there any other holes in the jar?

TEACHER: Were there any other holes in the jar? No. And can we categorize that question? Well, you asking about holes in a jar - are you asking about an object? The existance of an object?

STUDENT: Huh-uh.

STUDENT: Well, you're really inquirying more about the object - that's like that would be a title and then there'd be subtitles to go under it.

TEACHER: All right, and what would this subtitle be called? The object is jar and having holes or not having holes in what?

STUDENT: Its form.

TEACHER: Form or -- Carla.

STUDENT: Its characteristics.

TEACHER: Characteristics. Or conditions? The condition of the jar - is it broken or is it whole? Does it have holes or not? So we can have objects and we can have conditions.

TITLE: Analysis is an important part of inquiry. The children learn not to take facts for granted.

STUDENT: Well, I didn't know that there was a tube - it talks about water, too.

TEACHER: That's interesting. Do you want to ask a question or make a suggestion about it?

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STUDENT: Yes, was there water connected with the experiment?

TEACHER: Yes.

STUDENTS Oh.

TEACHER: All right. Now, how could you have found out that there was water there, without having to wait for this to have told you?

STUDENT: Could have asked.

TEACHER: You could have asked. You could have said, "Well, let's see. If this is a container, it must have something in it. Let's see if we can find it. My hunch is that there's air in it." "Is there air in it?" "Nope." "Is there alcohol in it?" "Nope." "Is there water in it?" "Yes." "Ah-hah!" Now you see how an explanation has to be changed quite a bit once you get different facts.

NARR: Inquiry starts with a problem. Ideas are generated and data gathered to test them.

NARR: Children learn how to use ideas, to organize their searching, and how to use what they find to reshape their ideas.

(STUDENTS WORKING IN GROUPS)

NARR: This requires freedom for the child to experiment with the process of inquiry, and take the responsibility for his own learning.

TITLE WITH MUSIC:

END OF PART II "Creating the Conditions for Inquiry"

CREDIT TITLES

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APPENDIX C

Newsletters